

# Rain Garden Handbook

for Western Washington



*A Guide for Design, Installation,  
and Maintenance*

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Curtis Hinman  
and Associates



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# Acknowledgements



## Principal Author

Curtis Hinman

*Low impact development and green stormwater infrastructure specialist*

Curtis Hinman  
and Associates

## Advisory Committee and Contributors

Amelia Bahr	<i>Water Quality Planner, RainWise Program</i>	King County
Melissa Buckingham	<i>Water Quality Improvement Program Director</i>	Pierce Conservation District
Peggy Campbell	<i>Senior Planner, Outreach Education</i>	Snohomish County
Marissa Chargualaf	<i>Graphic Designer</i>	OTAK
Jessica Farmer	<i>RainWise Program Manager</i>	Seattle Public Utilities
Erica Guttman	<i>Senior Extension Coordinator, Native Plant Salvage Program</i>	Washington State University
Gwendolyn Hannam	<i>Stillaguamish Senior Restoration Specialist</i>	Washington Department of Fish & Wildlife
Doug Howie	<i>Senior Stormwater Engineer</i>	Department of Ecology
Shauna Hansen	<i>Stormwater Engineer, Environmental Programs</i>	City of Tacoma
David Hymel	<i>Owner</i>	Rain Dog Designs
Marilyn Jacobs	<i>Owner</i>	Rain Dog Designs
Scott Kindred	<i>President</i>	Kindred Hydro
Linda Lyshall	<i>Executive Director</i>	Snohomish Conservation District
Zsofia Pasztor	<i>Founder, Executive Co-Director</i>	Farmer Frog
Michelle Perdue	<i>Stormwater Program Manager</i>	Kitsap County
Haly Rylko	<i>Community Conservation Project Manager</i>	Snohomish Conservation District
Valerie Streeter	<i>Stormwater Planner</i>	Tulalip Tribes
Merita Trohimovich	<i>Engineer</i>	City of Tacoma



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## TIPS



Look for these boxes with helpful tips and information throughout the handbook.

## TOOLS & MATERIALS CHECKLIST



These checklists are provided to help you gather the tools and materials you may need in each stage of creating your rain garden.

## LOCAL AND STATE REQUIREMENTS



These boxes remind you to check, during the planning process, for local stormwater management requirements that may apply to your project.



Erica Guttman



Erica Guttman

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This handbook will guide you through the following stages to successfully install a rain garden: PLAN, BUILD, PLANT, AND MAINTAIN. The handbook is written for conditions specific to Western Washington, including appropriate plant selections and sizing recommendations based on regional soils and rainfall patterns.



## IN THIS SECTION

- What is a rain garden?
- How rain gardens enhance our natural environment and quality of life
- Rain gardens as part of the overall approach to low impact development
- Rain gardens provide multiple benefits
- Four stages to create & sustain a rain garden
- Recommended timeline to install a rain garden

# Introduction



# What Is a Rain Garden?

A rain garden is a landscape area that collects, absorbs, and filters stormwater runoff from roof tops, driveways, patios, and other areas that don't allow water to soak in. Rain gardens are simply bowl-shaped gardens that:

- » Can be shaped and sized to fit your yard.
- » Are constructed with soil mixes that allow water to soak in rapidly and support healthy plant growth.
- » Can be landscaped with a variety of plants to fit the surroundings.

## ANATOMY OF A RAIN GARDEN





# How Rain Gardens Enhance Our Natural Environment and Quality of Life

Native soils and forests of Western Washington absorb, store, filter, and slowly release cool, clean water to rivers, streams, wetlands, lakes, and coastal waters. The rich diversity of life in marine and fresh water, as well as on land, depends on clean water to thrive.

As the region grows, native forests and soils are replaced with roads, rooftops, and other hard surfaces. When it rains or snows, more water flows off these surfaces compared to forests and meadows, carrying oil, fertilizers, pesticides, sediment, and other pollutants downstream. In fact, stormwater running off developed areas is the largest source of pollution entering Puget Sound. The flooding and pollution from stormwater harm salmon, orca and other aquatic communities as well as human health in Western Washington.

## HOW YOU CAN HELP



You can make an important contribution by reducing the amount of stormwater and pollutants coming from your property and entering our region's waterways by installing rain gardens in your yard and other places throughout your community.



Joel Rogers Photography



Robert Pittman



pugetsound.mapseed.org



scenicwa.com



istockphoto.com



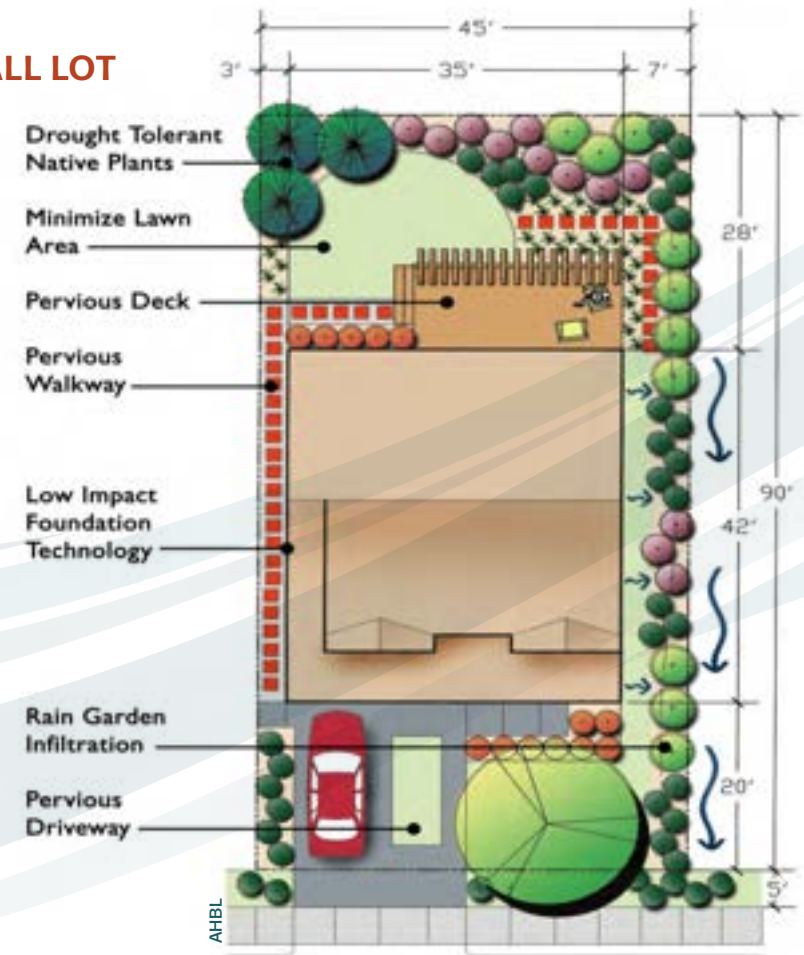
# Rain Gardens as Part of the Overall Approach to Low Impact Development

## LARGE LOT



Rain gardens are an important and versatile tool in the approach to manage stormwater called low impact development. In addition to rain gardens, preservation of natural areas, permeable pavement, compost amended soils, vegetated roofs, rainwater collection systems, and other techniques can help manage stormwater runoff in commercial and residential areas, including your property.

## SMALL LOT

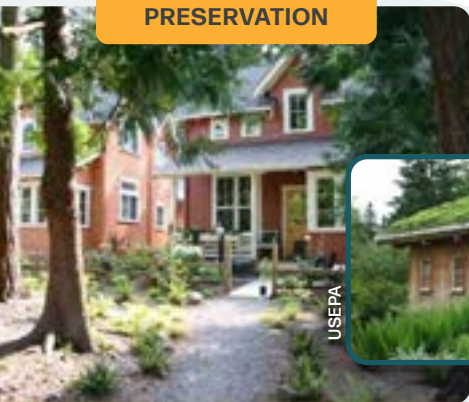


NATIVE VEGETATION PRESERVATION

PERMEABLE PAVEMENT

GREEN SPACE FOR RECREATION AND STORMWATER INFILTRATION

GREEN ROOF



# Rain Gardens Provide Multiple Benefits

*Rain gardens can:*

Reduce basement flooding, overflows in sewers, flooding on neighboring property and erosion in streams by absorbing runoff from hard surfaces.

Enhance landscaping and the appearance of home and yards.

Provide habitat for beneficial insects and birds.

Filter oil and grease from driveways, pesticides from lawns, and other pollutants before reaching groundwater, drinking water wells or the storm drain and eventually streams, wetlands, lakes, and marine waters.

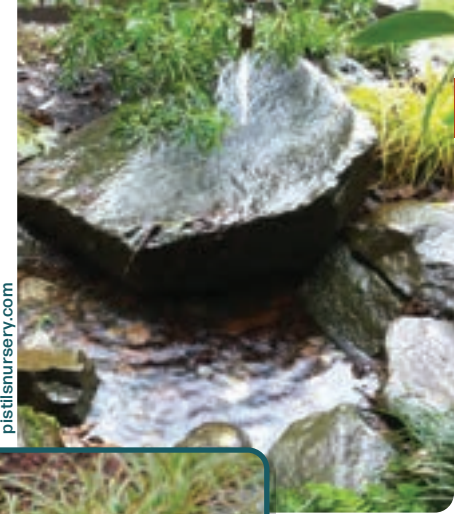
Increase the amount of water that soaks into the ground to recharge local groundwater.



pistilnursery.com

Michael Carey

beautifulleafgardens.com



Four Stages to Create & Sustain a

# RAIN GARDEN



# Plan

## 1



Mandi Roberts

- Check with your local municipality to confirm if there are any stormwater requirements for your project.
- Confirm the location of existing utilities (call 811) and avoid conflicts.
- Determine the area that will drain to your rain garden.
- Determine how water will flow from the area draining to the rain garden and confirm the location of the rain garden.
- Test the soil drainage rate where the rain garden will be located to be sure runoff will soak into the ground.
- Identify a safe place to direct overflow.
- Determine the size and shape of your rain garden.
- Confirm that the selected location will accommodate the rain garden.

# Build

## 2



Erica Guttman



Stewardship Partners

- Lay out your rain garden using stakes, rope, ground paint, and/or other tools.
- Excavate the soil.
- Create a path for water to the rain garden (e.g., extend a rain gutter downspout through an underground pipe or a swale) and a rock-lined entry for water into the rain garden.
- Level the excavated bottom of your rain garden (do not compact the soil).
- Provide a rock-lined overflow.
- Obtain an approved rain garden soil mix or mix compost into your existing soil.
- Place the soil mix and leave space below the overflow for ponding.
- Level the surface of the rain garden soil mix, and be sure not to over compact the soil.

# Plant

## 3



Erica Guttman

- Use a variety of small trees, shrubs, groundcovers, and grasses.
- Select plants suitable for the three planting zones within your rain garden and around the perimeter.
- Cover exposed soil with mulch to minimize erosion and weeds.
- Provide water to establish plants.

# Maintain

## 4



Erica Guttman

- Keep inlet and overflow clear of debris and well protected with rock.
- Do not use fertilizers, pesticides, or herbicides.
- Provide water as needed.
- Provide additional mulch as needed.

# Recommended Timeline to Install a Rain Garden

## PLAN

Testing soil drainage and groundwater level is best performed during the winter months (December through April with late winter or March ideal). See pages 15, 16, and 17 for guidelines on testing soil drainage rate.

## BUILD

Generally, the best time to build a rain garden is in fall or spring when the ground is moist but not soaking wet; however, rain gardens also can be built in the summer months. Avoid major excavation work in the winter. Disturbing the ground can cause serious erosion during rain storms, and if the ground is wet, machinery can compact the soil more than if it is dry, thus reducing the ability of the area to soak up water.

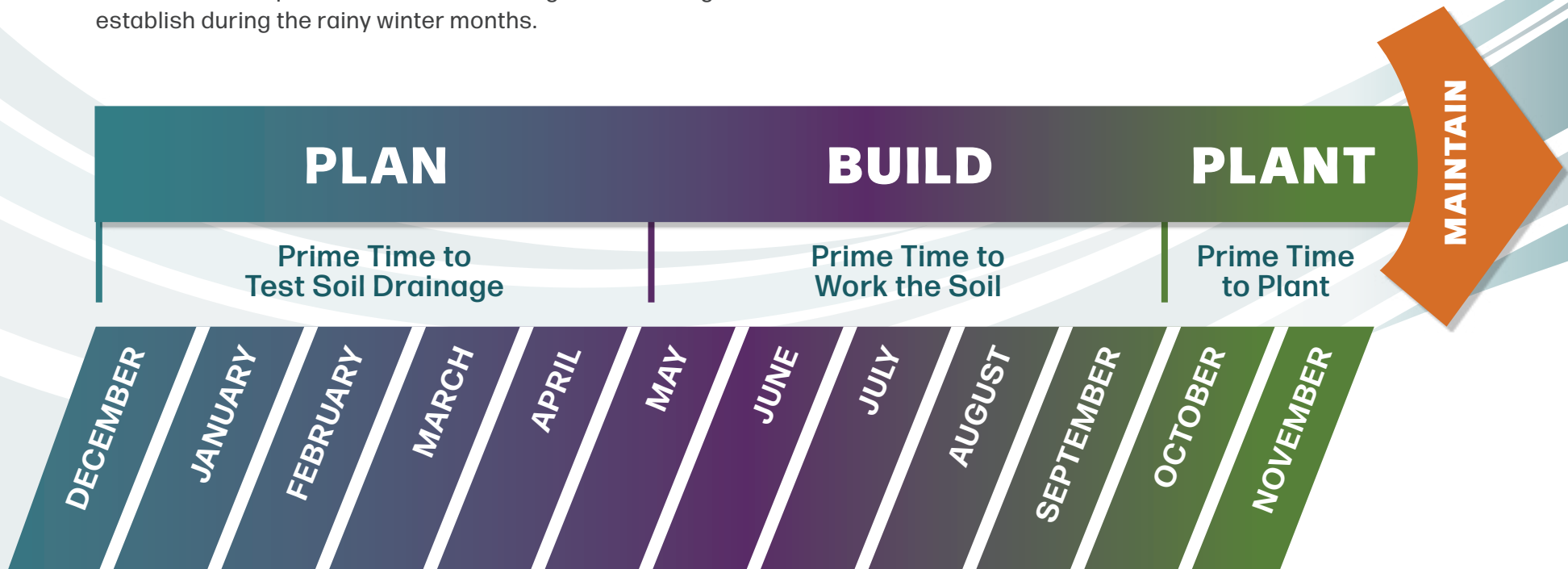
## PLANT

The best time to plant is in the fall, allowing trees and vegetation to establish during the rainy winter months.

## WHY YOU SHOULDN'T WORRY ABOUT MOSQUITOES



When properly designed and constructed, rain gardens drain rapidly with water present for only one to three days. Mosquitoes take four to seven days to become adults after eggs are deposited in standing water.



Rain gardens can be sized and shaped to fit in a variety of locations on your property or project site. Several important considerations are highlighted in this section of the handbook for planning and creating a successful rain garden design.

# Plan

# 1

## IN THIS SECTION

- How to get started
- Where to locate a rain garden
- Where not to locate a rain garden
- Check site drainage
- Test your soil
- Determine the size of your rain garden
- Rain garden sizing chart
- Rainfall regions for Western Washington
- Determine the shape of your rain garden

## TOOLS & MATERIALS CHECKLIST



- DRAWING PAPER** *(suggest grid paper)*
- PEN OR PENCIL**
- CALCULATOR**
- MAP** *(aerial maps of the property, building and utilities are very useful, also may include hand-drawn maps with important site features)*
- MEASURING TAPE**
- WATER SOURCE** *(for soil drainage test)*
- RIGID YARDSTICK OR SELF-MADE GAUGE** *(e.g., 2" x 2" board or pipe with 1/2" marks)*
- SHOVELS**
- DIGGING BAR**
- POST HOLE DIGGER**

# How to Get Started

The goal of this chapter is to provide guidance for locating and sizing rain gardens. To start planning your rain garden, gather the tools and materials listed on this page and follow the guidance in this section of the handbook.

These are the four tasks, explained in detail in the following sections, needed to determine the location and size of the rain garden:

1. Follow guidance on where to and where not to locate the rain garden in relation to slopes, utilities, buildings, existing vegetation, and site drainage.
2. Check site drainage and create a map with dimensions of roof tops, driveways and other hard surfaces that you want to direct to the rain garden as well as downspout locations.
3. Test the soil drainage at the preliminary location(s) selected for the rain garden(s).
4. Determine the size and location and confirm the rain garden fits in selected location.

## CONSIDER LOCAL AND STATE REQUIREMENTS

Keep in mind that if you are creating or replacing between 2,000 and 5,000 square feet of hard surfaces (such as a building addition or expanding a driveway), or if you are disturbing 7,000 square feet or more of land, state and local stormwater management requirements may apply to your project. Note, that if you have a building permit for a project that may include rain gardens to manage stormwater from new or replaced hard surfaces or disturbed land, the local jurisdiction will include stormwater management requirements on that permit. For more information on state requirements for rain gardens through the Department of Ecology see Appendix C.

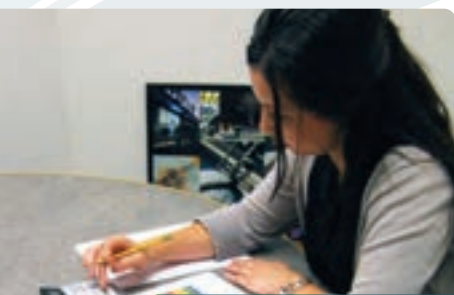
For most homeowners installing rain gardens, these requirements do not apply. If your project does trigger stormwater requirements refer to Appendix C for additional information. Also, look for the red alert boxes as you read through the handbook.



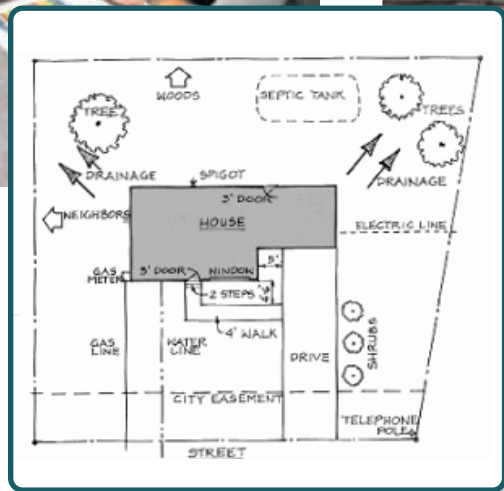
# Where to Locate a Rain Garden

## DO LOCATE A RAIN GARDEN WHERE:

- » It improves the appearance of your home (rain gardens can provide attractive visual buffers from roads or neighboring homes).
- » You have enough space and in a place that will not be used for other purposes in the future such as a reserve drainfield.
- » The overflow can direct water safely away from the home and neighboring property.
- » Water flows into the garden by gravity.



Zsolt Pasztor



## Guidance for Locating Rain Gardens near or on Slopes

If you want to place a rain garden near or on a slope greater than 10 percent, have a qualified geotechnical engineer evaluate the site for potential problems. Collecting and allowing water to soak into steep slopes can cause instability and possibly landslides.

### CALCULATING SLOPE

Slope is typically described in degrees or percent. When using percent, calculate the rise (vertical distance) divide by the run (horizontal distance) and multiply by 100.

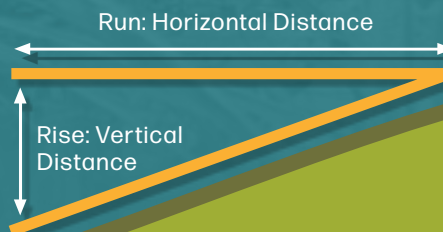
$$\text{Slope} = \frac{\text{Rise (Vertical Distance)}}{\text{Run (Horizontal Distance)}}$$

$$\text{Example: Slope} = \frac{2 \text{ ft Rise}}{20 \text{ ft Run}} = .10$$

To convert decimal to percent, multiply by 100 and include the % symbol:  $.10 \times 100 = 10\%$

The easiest way to multiply by 100 is to move the decimal point two places to the right.

*\*Consult a geotechnical engineer if the slope is 10% or more.*



# Where NOT to Locate a Rain Garden

## DON'T LOCATE YOUR RAIN GARDEN:

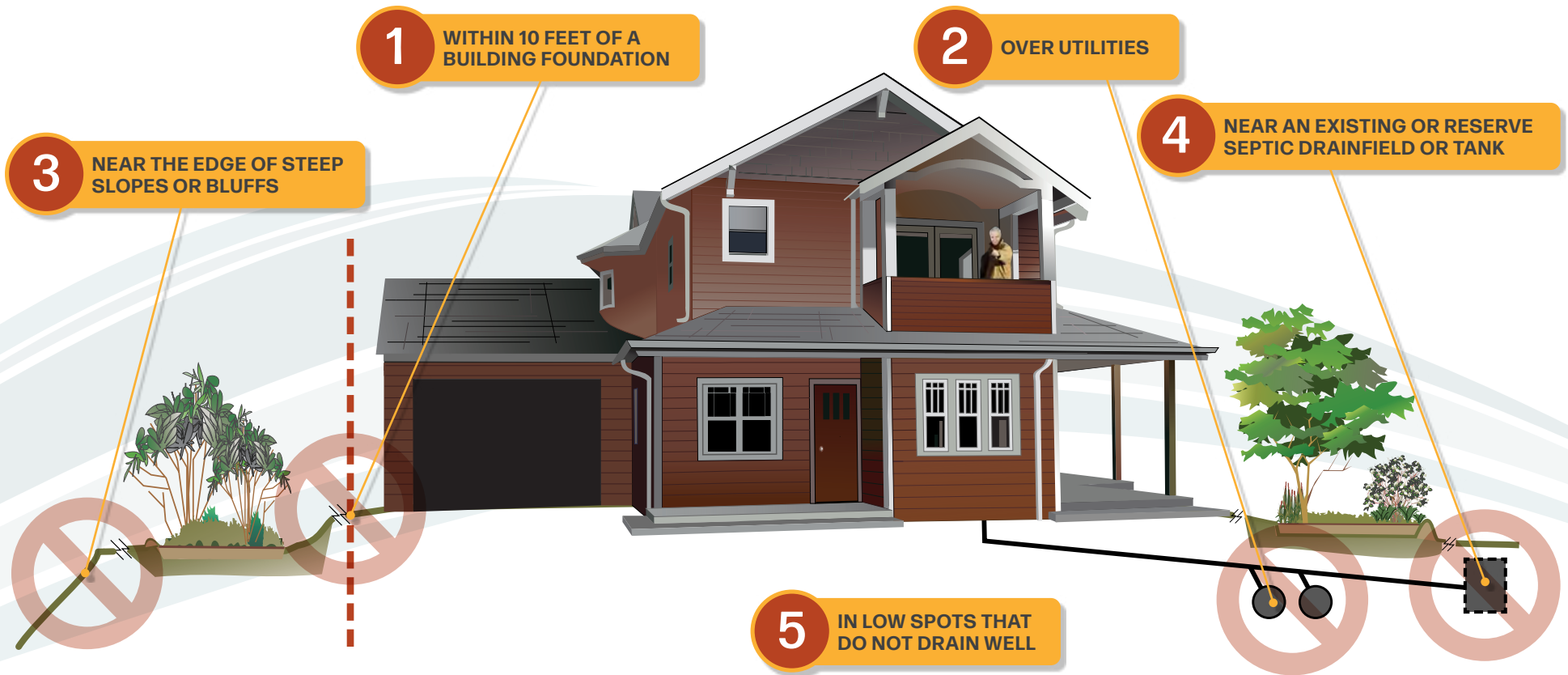
- 1. Within 10 feet of a building foundation:** to avoid water getting into basements and crawl spaces.
- 2. Within 5 feet of utilities:** to prevent extra expense and hazardous conditions, make sure to have all utilities located and marked before digging. Utility companies typically locate and mark power, gas, phone, water, and other lines and facilities. Contact utility locate services by calling 811.
- 3. Near the edge of steep slopes or bluffs:** the additional water soaking into the ground on steep slopes can cause landslides or unwanted settling. In general, slopes should be less than 10% for a conventional rain garden. If the rain garden is within 50 feet of a slope that is more than 10%, consult with a geotechnical engineer.
- 4. Near a septic tank, septic drainfield, or reserve drainfield area:** generally, if uphill of a septic system, provide at least 50 feet and if downhill provide at least 10 feet between the rain garden and the existing or planned septic system. Consult your local health department for specific setback requirements.
- 5. In low spots that do not drain well:** these areas may help naturally slow down and store stormwater on your property, yet locating a rain garden here will not improve drainage and rain garden plants may not survive.
- 6. In areas that would require disturbing healthy native soils, trees, and other vegetation:** these areas already do a good job of filtering and storing stormwater. To adequately protect trees do not disturb soil in an area under the tree with a radius that measures 1 foot out from the tree for every 1 inch of tree trunk diameter. Measuring the tree trunk diameter should be taken at 4.5 feet above the ground height. For example, if the tree trunk diameter at 4.5 feet is 6 inches then measure out from the tree trunk 6 feet and mark a circle around the tree.
- 7. Where there is shallow groundwater during the winter:** a rain garden will not drain or function properly if groundwater rises to within one foot of the excavated soil surface during the winter. To determine if there is shallow groundwater in the location you are considering for a rain garden see page 15 "Test Your soil."
- 8. Near wells:** your rain garden must be set back a minimum of 100 feet from drinking water wells.

### DIAL 811— CALL BEFORE YOU DIG!



Be sure to have all your utilities (gas, power, water, communications, etc.) located and marked as you plan where to build your rain garden and before digging to test for soil and groundwater conditions. In addition to the 811 service that primarily locates utilities in public rights of way, utility locate businesses can be hired to locate and mark public and private utilities. You also can contact the utility providers directly for more information. Note: utility locates expire after 45 days and the property owner is responsible for calling 811 to have utilities re-marked after that.

# Where NOT to Locate a Rain Garden



**5** IN LOW SPOTS THAT DO NOT DRAIN WELL

**6** IN AREAS THAT WOULD REQUIRE DISTURBING HEALTHY NATIVE SOILS AND VEGETATION

**7** WHERE THERE IS SHALLOW GROUNDWATER DURING THE WINTER

**8** NEAR WELLS—STAY BACK 100 FEET FROM DRINKING WATER WELLS

## LOCAL AND STATE REQUIREMENTS ALERT



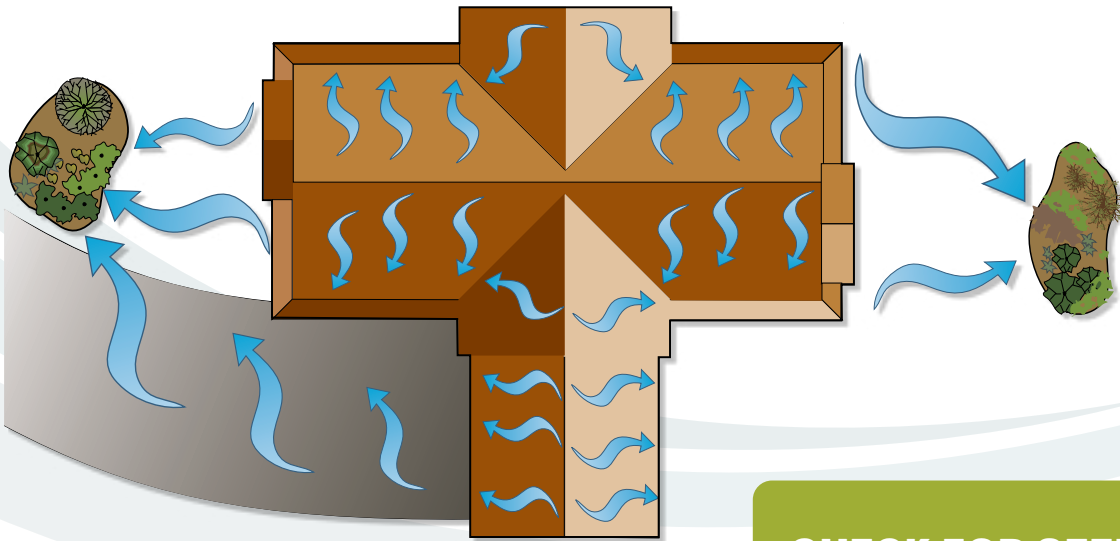
If your project is using a rain garden for flow control required by a local jurisdiction building permit see Appendix C for details.

# Check Site Drainage

## What areas will drain to your rain garden?

First, you need to assess your property or project site to determine the areas that will drain to your rain garden. Roof tops, driveways, concrete patios, and landscape areas with compacted soil produce runoff that rain gardens can absorb and filter. You may want to capture all or part of the water from these areas in one or more rain gardens.

You can take measurements and draw a site map with dimensions of the hard surfaces to capture in the rain garden or access online aerial maps.



## CONSIDER THE FOLLOWING WHEN DETERMINING WHAT AREAS YOU WANT TO DRAIN TO THE RAIN GARDEN

- » Where are the roof downspouts, and is the potential site for the rain garden located below where the downspout meets the ground so that rainwater can freely flow into it by gravity?
- » If directing water from a driveway, is there a way to collect that water and direct it to the rain garden?
- » Water can be delivered to the rain garden across a landscaped area, through an open swale lined with plants and decorative rock, or through an underground pipe from a downspout. Be careful to minimize disturbance to the roots of existing trees and other vegetation.
- » Rain gardens can be placed in more than one location. For example, you can direct water from one part of the roof to a rain garden in the back yard and water from another part of the roof to a rain garden in the front yard.

### CHECK FOR SEEPS AND SPRINGS



In the winter observe the areas that will be draining to your rain garden and check for seeps, springs and other sources of water that may be coming from around your site and adjacent properties. If present, consider this extra water in locating and sizing the rain garden.

# Test Your Soil

After selecting a preliminary location for your rain garden, the next step is to test the soil in that location. You will be evaluating the soil texture (size of soil particles) and the soil drainage rate (the amount of time it takes for water to soak into the ground). Understanding these characteristics will help you confirm the location and appropriate size of the rain garden.

## BE SURE TO CHECK FOR SHALLOW GROUNDWATER



Avoid locating your rain garden in an area with shallow groundwater. The ideal time to test the groundwater level is late winter (February and March) when the ground is fully saturated. You will potentially dig two test holes in the preliminary rain garden location, one for the groundwater test and a second (if shallow groundwater is not present) for the soil drainage test. The test hole for groundwater is separate from the drainage test because it is deeper (remember from page 12 that we want to know if shallow groundwater comes within one foot of the bottom of the rain garden). Dig down 36 inches (a post hole digger works well for this) and look into the hole. If you see water seeping in from the bottom or sides, find a different location at a higher elevation for your rain garden. If you don't see groundwater, conduct the soil drainage test in a nearby spot.

Clay soil—feels sticky, smooth, and can be molded like modeling clay.



Curtis Hinman

Sandy soil—feels gritty and crumbles easy.



Curtis Hinman

## SOIL TEXTURE



Soil texture is determined by the amount of sand, silt, and clay in the soil. The mix of these components affects how well soil drains and holds water and nutrients for plants to use.

## There are four steps to complete the soil drainage test

1. Determine depth of rain garden
2. Dig test hole
3. Evaluate soil texture
4. Fill the hole with water and observe drainage rate

## 1. DETERMINE DEPTH OF THE RAIN GARDEN

The depth of the rain garden will determine the depth of your soil drainage test hole. The depth of the rain garden equals the maximum ponding depth (from the top of the rain garden soil mix to the overflow...usually 6 inches) plus the depth of rain garden soil mix (12 to 24 inches with 18 inches typical). Example: 6-inch ponding depth plus 18-inch rain garden soil mix = 24 inches for the depth of the soil drainage test hole.

## 2. DIG TEST HOLE

You've determined the test hole depth from step 1. The test hole diameter should be approximately 24 inches.



Erica Guttman



Colleen Miko

## 3. EVALUATE SOIL TEXTURE

As you dig, and before adding water to the hole to test drainage, evaluate the texture of the soil.

- » If the soil is moist, put some in the palm of your hand and try to squeeze it into a ball. If the soil:
  - Falls apart or can be broken up easily and is gritty feeling, this suggests a sandier, well-draining soil.
  - Is sticky, smooth, and forms a ball that can be worked like modeling clay, this suggests a poor draining soil with higher clay content.
  - Is smooth but not sticky, then it is likely a silty soil and moderate to poor-draining.
- » If the soil is dry, add water a few drops at a time, break down the chunks and work the water into the soil, and perform the soil texture test.

Record your observations. These observations will help determine how the rain garden is constructed in the next chapter (Build).

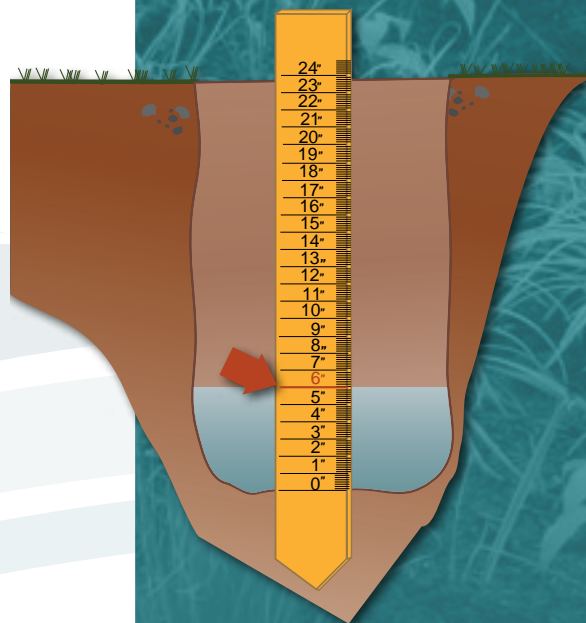
## EXAMPLES FOR DETERMINING SOIL DRAINAGE RATE

### 4. FILL THE HOLE WITH WATER AND OBSERVE DRAINAGE RATE

Secure a measuring stick or rod in the test hole. A gauge can be made from a stake or pipe with clearly marked/bold markings every half inch.

- » **Soak period:** fill the hole with 6 to 12 inches of water (depending on ponding depth) and add water to maintain that depth for 3 hours.
- » **Measure drainage rate:** stop adding water after three hours. Record the depth of water every 15 minutes until all water is gone from the test hole. The measured drainage rate is recorded in inches/hour. Use the slowest drainage rate recorded during a 15-minute period for your drainage rate. Remember to multiply the 15-minute time period by 4 to get inches/hour rather than inches/15 minutes. See how to determine the drainage rate in the examples shown on the right.

**Important note:** while this test can be performed in the summer, testing the soil drainage rate is much preferred in the winter to provide a more accurate rate as well as the opportunity to observe possible shallow groundwater (see *Be Sure To Check For Shallow Groundwater* on page 15).

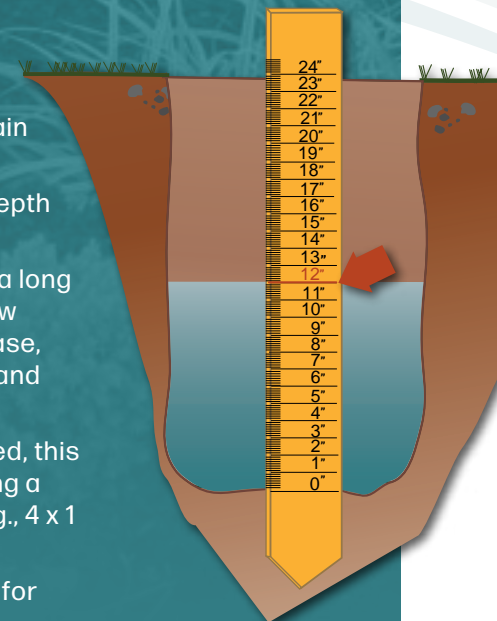


#### EXAMPLE #1 (6-inch Ponding Depth)

- Fill the hole with 6 inches of water and maintain the 6-inch depth for 3 hours.
- Stop adding water after 3 hours and record depth every 15 minutes until water is gone.
- The water is gone after about 5 hours and the smallest measurement during a 15-minute time period is 1/4 inch or 1/4 inch per 15 minutes
- To get inches per hour multiply by 4 ( $4 \times 1/4 \text{ inch} = 4/4$ ) to get 1 inch per hour.
- Record the drainage rate, which you will need for the Rain Garden Sizing Chart on page 20.

#### EXAMPLE #2 (12-inch Ponding Depth)

- Fill the hole with 12 inches of water and maintain the 12-inch depth for 3 hours.
- Stop adding water after 3 hours and record depth every 15 minutes until water is gone.
- With a 12-inch ponding depth, water may take a long time to drain from the hole if the soil has a slow drainage rate (e.g., 1/2 inch per hour). In this case, stop recording the water depth after 4 hours and use the depth recorded during the last hour.
- If the measurement during the last hour is used, this is the drainage rate. If the measurement during a 15-minute time period is used multiply by 4 (e.g.,  $4 \times 1 \text{ inch} = 4$ ) to get 4 inches per hour.
- Record the drainage rate, which you will need for the Rain Garden Sizing Chart on page 20.



# Determine the Size of Your Rain Garden

Once you have tested the drainage rate of the soil, you are ready to determine the size of the rain garden. Four questions are important:

1. *How well does your soil drain?*
2. *How much area will drain to the rain garden?*
3. *How much rainfall does your location receive?*
4. *How much room do you have for the rain garden?*



## 1. HOW WELL DOES YOUR SOIL DRAIN?

In the last section (Test Your Soil) you calculated the soil drainage rate. Refer to this rate to size your rain garden using the sizing chart on page 20.

## 2. HOW MUCH AREA WILL DRAIN TO THE RAIN GARDEN?

To determine the drainage area, measure the driveway, rooftop, landscape areas, and other surfaces that will drain to the rain garden (see examples on pages 14 and 19). Note the area in square feet. To find the area of a rooftop, measure the length and width of the building including the roof overhang. Do not worry about the slope of the roof since slope does not influence the drainage area.

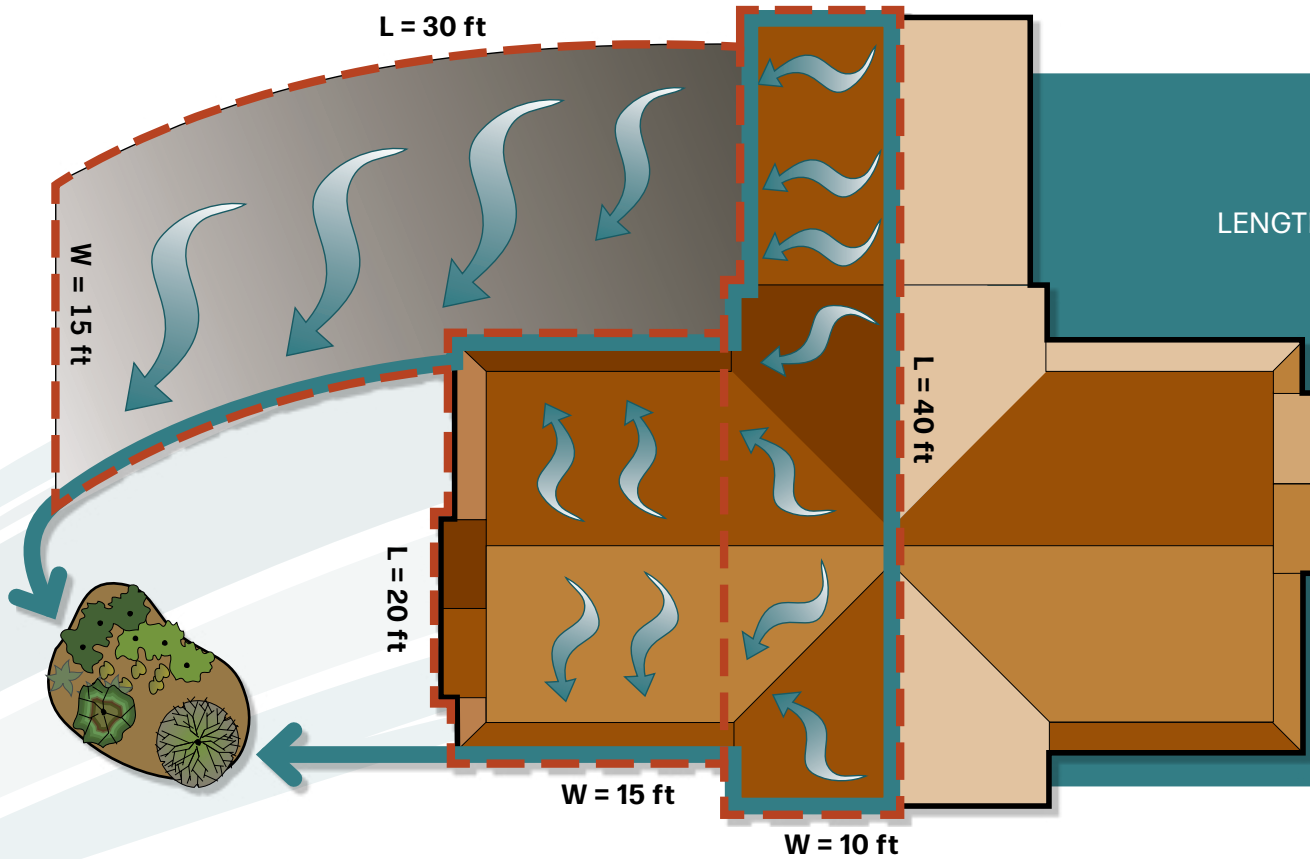
## 3. HOW MUCH RAINFALL DOES YOUR LOCATION RECEIVE?

Look at the maps on pages 21 and 22 to find your location and how much rainfall that location receives. Refer to the rainfall amount to size your rain garden using the sizing chart on page 20.

## 4. HOW MUCH ROOM DO YOU HAVE FOR THE RAIN GARDEN?

Go to the area selected for the rain garden and confirm that the size determined in the sizing chart will fit on the site. Rain gardens are often a curved shape to be aesthetically pleasing; however, you can simply measure a rectangle or square shape to confirm the area will accommodate the rain garden and then later mark out the final shape.





### Example

LENGTH x WIDTH = AREA IN SQUARE FEET (sq ft)

#### DRIVEWAY

15 ft x 30 ft = 450 sq ft

#### ROOF

15 ft x 20 ft = 300 sq ft

10 ft x 40 ft = 400 sq ft

Total = 1,150 sq ft

Refer to page 23 to see how the rain garden for this drainage area is sized, how to determine the perimeter and where to start digging.



## RAIN GARDEN SIZING CHART

	Rainfall Region (Average Annual Precipitation in Inches)						SIZING FACTOR
	REGION 1 (<30)	REGION 2 (30-40)	REGION 3 (40-50)	REGION 4 (50-70)	REGION 5 (70-90)	REGION 6 (>90)	
Soil Drainage Rate							
Less than 0.3 in/hr (poor-draining soils)	5%	6%	7%	11%	18%	21%	
0.3 - 2.0 in/hr (moderate-draining soils)	4%	5%	6%	8%	12%	14%	
Greater than 2.0 in/hr (well-draining soils)	4%	5%	6%	7%	8%	9%	



Erica Guttman

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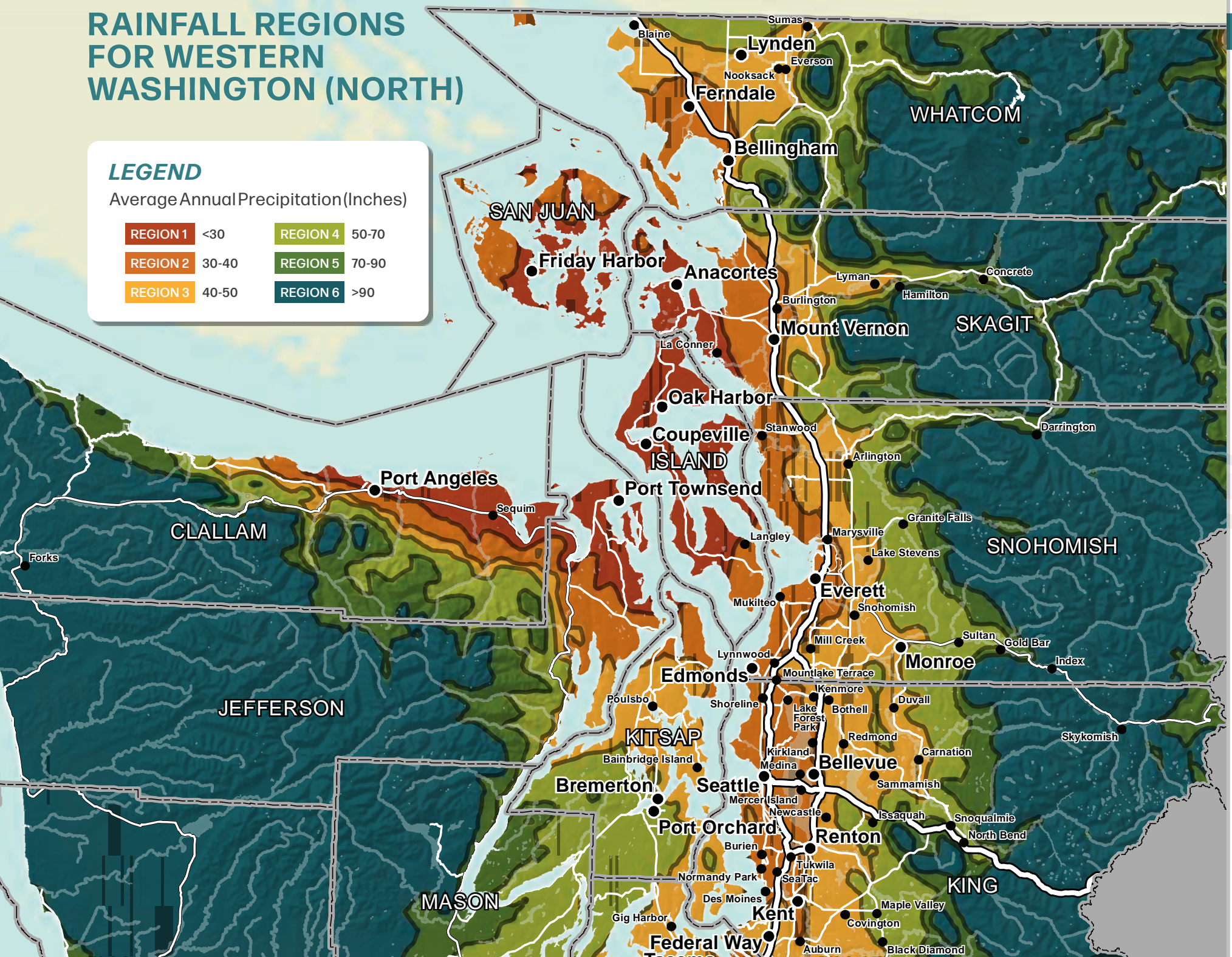
Multiply the drainage area by the sizing factor percentage to find the top surface of the ponding area for your rain garden. The top surface of the ponding area is the area of the water in the rain garden at the level of the overflow. See page 23 for guidelines to determine the perimeter and where to start digging the rain garden.

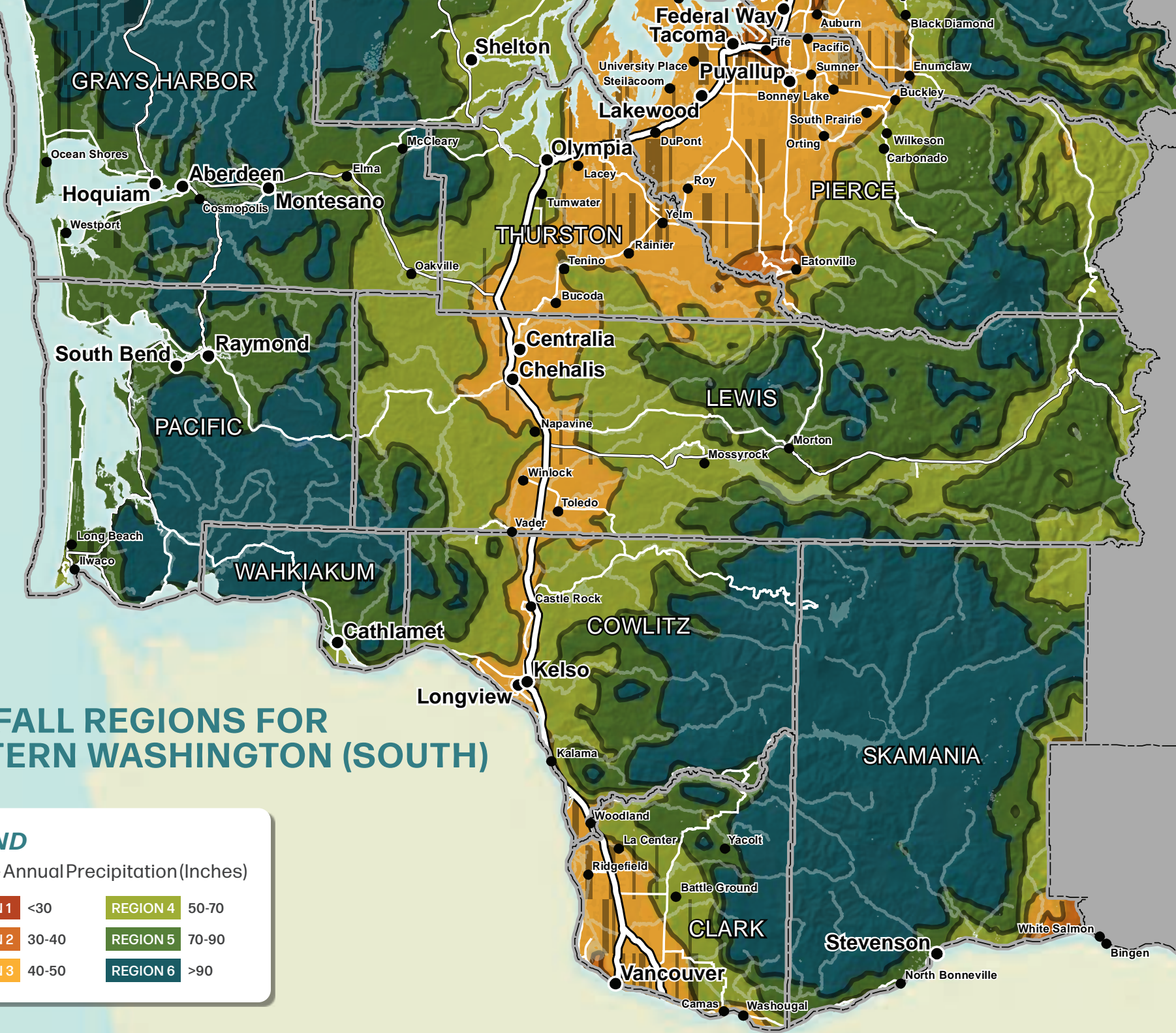
# RAINFALL REGIONS FOR WESTERN WASHINGTON (NORTH)

## LEGEND

Average Annual Precipitation (Inches)

REGION 1	<30	REGION 4	50-70
REGION 2	30-40	REGION 5	70-90
REGION 3	40-50	REGION 6	>90





## RAINFALL REGIONS FOR WESTERN WASHINGTON (SOUTH)

### LEGEND

Average Annual Precipitation (Inches)

REGION 1	<30	REGION 4	50-70
REGION 2	30-40	REGION 5	70-90
REGION 3	40-50	REGION 6	>90

## Overflow Containment Area, Rain Garden Perimeter, and Where to Start Digging

Occasionally, such as after a heavy storm, water may rise above the ponding level and start to pour out the overflow. Providing a rim of soil above the overflow will provide additional capacity and contain ponded water so it flows out the designed overflow location should the overflow become partially blocked with debris. This extra height, called the overflow containment area, should be a minimum of 6 inches high. The rock-lined overflow will cut through the overflow containment area in a depression that slopes outward from the ponding area.

If your side slopes are the steepest recommended of 2:1 (2 feet horizontal to 1 foot vertical), start digging out 12 inches in horizontal distance from the area you found in the sizing chart on page 20 (this is the top surface of the ponding area or the bottom of the overflow) to provide the 6 inches of vertical depth for the overflow containment. If your side slopes are more gradual, such as 3:1 or 4:1, you will need to start digging out 18 or 24 inches from the top surface of the ponding area to create the 6-inch overflow containment depth. You may also create the overflow containment by building a water-tight berm at the perimeter of the ponding area.

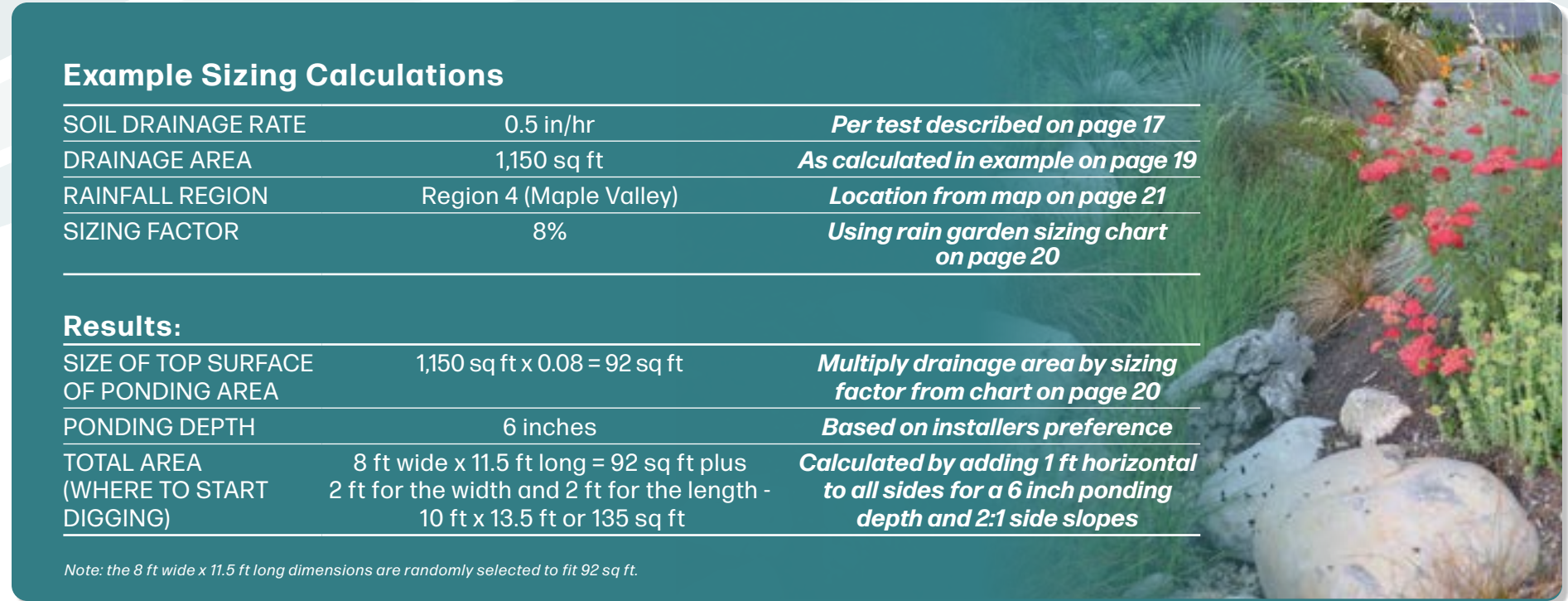
### Example Sizing Calculations

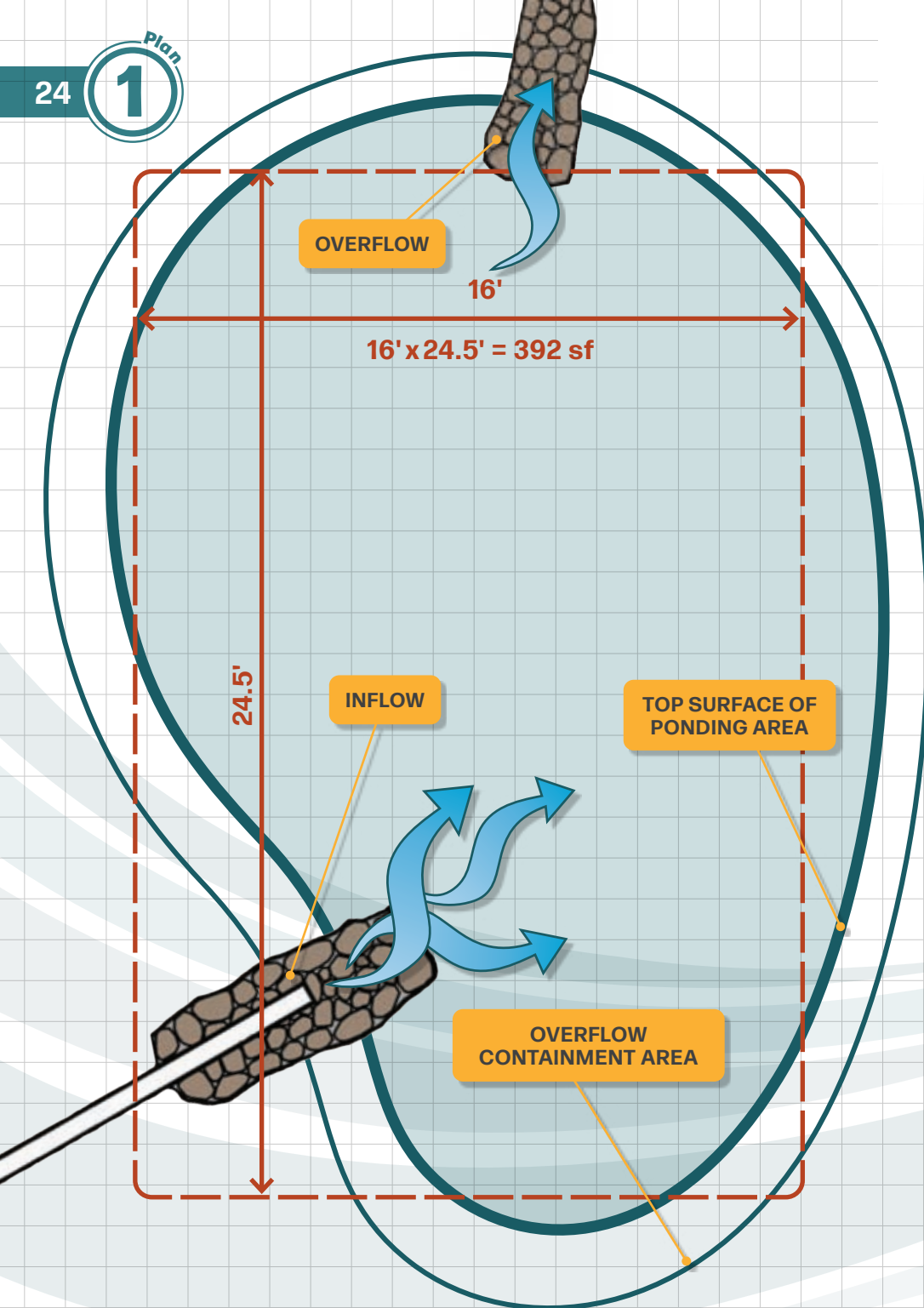
SOIL DRAINAGE RATE	0.5 in/hr	<i>Per test described on page 17</i>
DRAINAGE AREA	1,150 sq ft	<i>As calculated in example on page 19</i>
RAINFALL REGION	Region 4 (Maple Valley)	<i>Location from map on page 21</i>
SIZING FACTOR	8%	<i>Using rain garden sizing chart on page 20</i>

### Results:

SIZE OF TOP SURFACE OF PONDING AREA	1,150 sq ft x 0.08 = 92 sq ft	<i>Multiply drainage area by sizing factor from chart on page 20</i>
PONDING DEPTH	6 inches	<i>Based on installers preference</i>
TOTAL AREA (WHERE TO START DIGGING)	8 ft wide x 11.5 ft long = 92 sq ft plus 2 ft for the width and 2 ft for the length - 10 ft x 13.5 ft or 135 sq ft	<i>Calculated by adding 1 ft horizontal to all sides for a 6 inch ponding depth and 2:1 side slopes</i>

*Note: the 8 ft wide x 11.5 ft long dimensions are randomly selected to fit 92 sq ft.*





# Determine the Shape of Your Rain Garden

The shape of the rain garden is often determined by existing features such as the need to avoid structures, trees, and utilities. Rain gardens can be shaped to fit available space and site conditions. For example, a long, narrow rain garden works well on gently sloping ground. Position the long dimension so it follows the contour of the slope, creating a bench. This will reduce the amount of excavation needed to keep the bottom flat so water doesn't flow to one end and pool, leaving the remaining area dry. See page 35 for more information about construction on slopes.

Remember to provide additional space for the overflow containment area and plantings around the ponding area.

## COUNT THE GRID BOXES



When creating an irregular shape, lay out the rain garden on grid paper to confirm the correct size. Use the grid paper to check if your irregular-shaped ponding area is sized appropriately. After drawing a square or rectangle with the calculated square footage you need, draw your desired shape. Count the number of squares inside the square or rectangle and the number of squares inside the desired shape to make sure they match. Adjust your design if needed to get the number of squares to match.

Using the information from Chapter 1 (Plan), this section provides guidelines for how to build your rain garden.



# Build

# 2

## IN THIS SECTION

- Prepare for construction
- Locate and design the inflow
- Always provide an overflow
- Rain garden cross section
- Layout
- Excavate
- Building a rain garden with vertical sidewalls
- Create a flat, level bottom
- Install the inflow and overflow
- Place the rain garden soil mix
- Edging
- Mulch

# Prepare for Construction

## TOOLS & MATERIALS CHECKLIST



- MEASURING TAPE
- WOOD STAKES
- ROPE, STRING, GROUND PAINT, AND/OR BUILDER'S CHALK *(for layout)*
- HAMMER
- SHOVELS AND RAKES
- DIGGING BAR
- MINI-EXCAVATOR *(optional motorized excavation equipment)*
- LEVEL *(water level, laser, string, or other type of level for determining elevation and slope)*
- STRAIGHT 2" X 4" BOARD *(to level bottom)*
- RAIN GARDEN SOIL MIX & MULCH
- ACCESS TO WATER
- PIPE FOR INFLOW IF NEEDED
- ROCK FOR OVERFLOW AND INFLOW

The planning is over and it's time to start construction. These are the main tasks ahead:

1. Confirm the best locations for the inflow and overflow.
2. Make sure utilities are located and clearly marked.
3. Lay out the proposed plan for your rain garden on the ground using rope, string, ground paint, and/or builder's chalk. Mark the inflow and overflow with wood stakes.
4. Decide if you will import a new rain garden soil mix or amend your existing on-site soil with compost.
5. Excavate the rain garden accounting for the ponding depth, the overflow containment area, and the depth of the soil mix.
6. Install the pipe, swale, or roof downspout extension from contributing areas that will deliver water to the rain garden.
7. Place the soil mix (do not over compact).
8. Armor your inflow and overflow areas with rock (cobble larger than 2 inches).
9. Place edging around the perimeter of the rain garden area if desired.



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# Locate and Design the Inflow

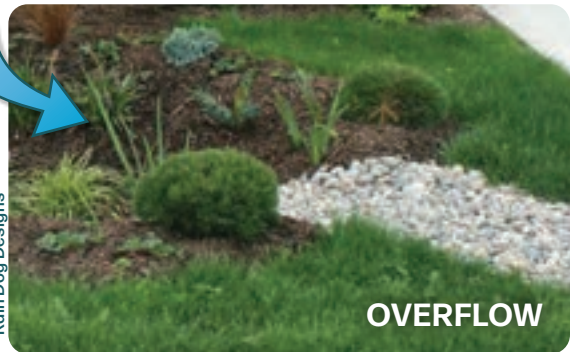
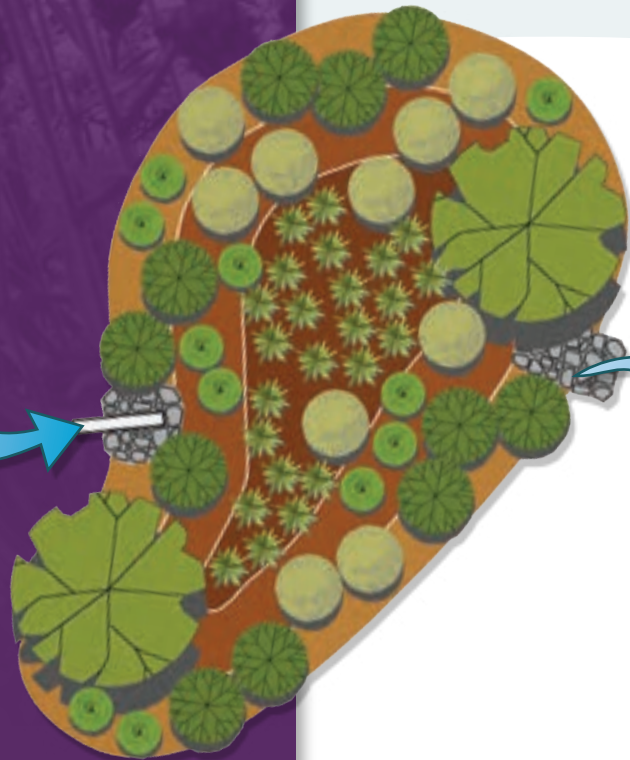
Water can be delivered to your rain garden across a landscaped area, through an open swale with plants and decorative rock, or through a pipe. Whatever technique is used, consider the slope and protect against erosion. If the slope is gentle (about 2% or less) and the swale or landscaped area is well protected with vegetation or rock, then no special design is needed. If the slope is more than 2% and water is directed through a swale, consider adding small rock check dams every 5 to 10 feet to slow the water (see page 40 for rock check dam example). Where water enters the rain garden from a swale or pipe, place a pad of rock to slow the water and guard against erosion.

# Always Provide an Overflow

During the winter most of the water that flows into your rain garden will soak into the ground. Occasionally, the rain garden may fill up and overflow when the ground is wet and a big storm delivers a lot of rain or there are many consecutive storms. So, design the rain garden with an overflow lined with rock to protect from erosion. Extend the rock about 4 feet outside the rain garden to slow water as it exits. Direct water safely to the storm drain or disperse into the landscape (avoid directing water over a driveway or sidewalk where it could freeze in winter and create a slipping hazard). If you design a rain garden that is shared between homes, make sure everyone is in agreement about where excess water can be directed.

**CHECK THE FLOW OF WATER** 

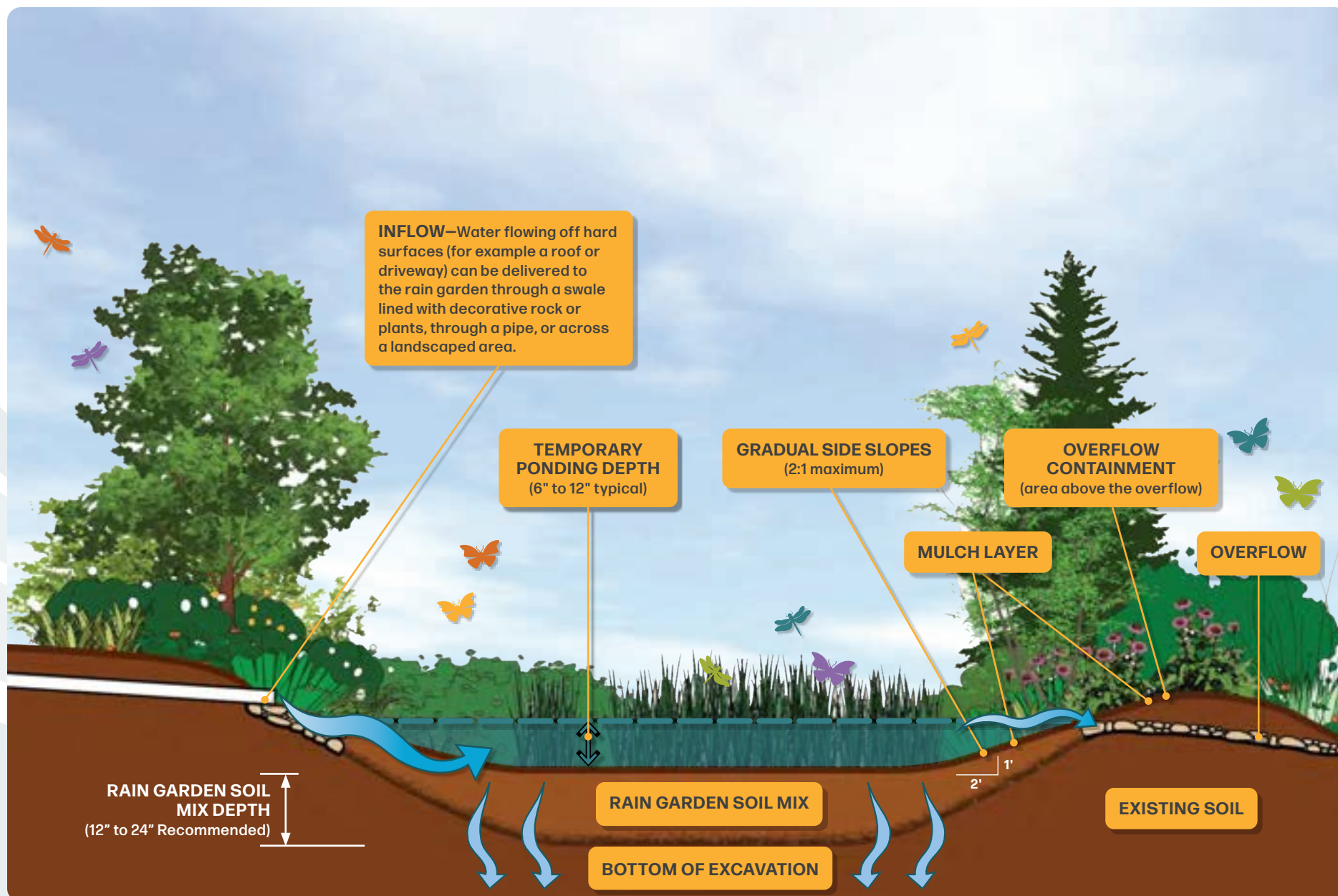
If using a buried pipe to deliver water to the rain garden, check that water flows easily from the source to the rain garden before burying the inlet pipe.



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# Rain Garden Cross Section



# Layout

First, lay out your rain garden to see if it fits the area well. Remember the guidance about where and where not to locate your rain garden in Chapter 1 (Plan). Rope, string, a hose, ground paint, and/or builder's chalk are good ways to mark the area because the boundaries can be easily adjusted to your preference. You can also use wood stakes to mark proposed inflow and overflow locations and other features of your rain garden.

Once you have marked the rain garden perimeter and before excavating, check again to make sure that the swale or pipe is lower at the rain garden than the source. At the same time check that water can easily flow to the rain garden across the landscaping or through a swale or pipe. Note that these features will be installed after excavation. See page 40 for more inflow installation details.



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## REMEMBER TO CALL BEFORE YOU DIG



If the utility markings that were located during the initial rain garden planning are unclear or faded, call 811 again and have the locations confirmed and remarked. Utility locates expire after 45 days, and it is your responsibility to contact 811 to have utilities re-marked before construction. Remember that 811 primarily locates utilities in the public right-of-way. If there are private utilities near your rain garden site, call those providers to locate and mark the lines and connections. You can also retain utility locate businesses to locate and mark public and private services.

## AVOID DISTURBING EXISTING VEGETATION AND ESPECIALLY MATURE TREES



As you lay out the rain garden remember to avoid vegetation you want to preserve. To adequately protect trees do not disturb soil in an area under the tree with a radius that measures 1 foot out from the tree for every 1 inch of tree trunk diameter. Measure the tree trunk diameter at 4.5 feet above the ground height. For example, if the tree trunk diameter at 4.5 feet is 6 inches, then measure out from the tree trunk 6 feet and mark a circle around the tree. The circle will have a diameter of 12 feet plus the diameter of the tree trunk.



# Excavate

Before digging, determine the depth of excavation necessary to accommodate the ponding depth, soil mix depth, and overflow containment area. Recommended ponding depth is 6 inches to 12 inches. Recommended overflow containment depth is 6 inches minimum. Recommended rain garden soil mix depths are 12 to 24 inches. Examples for determining excavation depth are provided for each of the three rain garden soil mix options below.

## Rain Garden Soil—Three Options

There are three options for providing rain garden soil. Instructions about how to choose one of these options are provided on the following pages.

- » **OPTION 1. Excavate and Replace Soil:** Excavate the soil and completely replace with new rain garden soil mix.
- » **OPTION 2. Excavate and Amend Soil for Reuse:** Excavate the soil, amend it by mixing in compost, then put it back into the rain garden.
- » **OPTION 3. Amend Soil in Place:** Amend your existing soil in place by mixing in compost after you've excavated to the proper depth.

### MANY HANDS MAKE LIGHT WORK



If you are digging a small rain garden that is not very deep, digging by hand with friends may work well. If you're installing a bigger rain garden, consider renting a mini-excavator (the ground often gets more dense and harder to dig the deeper you go).



## OPTION 1—EXCAVATE AND REPLACE SOIL

Option 1 should be used when you have poor draining soils (see the Rain Garden Sizing Chart on page 20 for definition of poor draining soils). In Chapter 1 (Plan) you examined the texture and drainage rate of the soil in your rain garden area. Soils high in clay content do not drain well or support good plant growth. If your soil forms a cohesive ball and can be shaped like modeling clay, it has high clay content. In this case, you should replace the soil with a rain garden soil mix from a soil supplier. Typically, 12 to 24 inches of rain garden soil mix is recommended. However, if you have poor quality soils, consider using the 24-inch depth for better plant growth and storing more water.

### Excavation Depth Example:

6" overflow containment (*assuming no berm is constructed above existing ground surface*)  
 + 6" ponding depth  
 + 24" rain garden soil mix (*imported*)  


---

 = 36" excavation depth

## RAIN GARDEN SOIL MIX



A good rain garden soil mix typically contains about 60-70% screened sand and 30-40% compost by volume. Contact your local landscape and compost suppliers for rain garden soil mixes. Note that rain garden soil mixes are often called bioretention soil media or BSM by suppliers.

## SAND & COMPOST SOIL MIX NEAR WATER BODIES



Do not use the sand and compost rain garden soil mix if your property is adjacent to freshwater lakes, streams or wetlands. Nutrients from the compost can seep through the soil, get into nearby waterways, and harm water quality and aquatic life. Instead use a sandy topsoil mix with low compost content.

## HOW MANY CUBIC YARDS DO YOU NEED?

Soil and compost suppliers deliver material in cubic yards. To calculate how many cubic yards you need, start by converting the rain garden soil depth from inches to feet.

**EXAMPLE:**  $18 \text{ inches} \times \frac{1 \text{ foot}}{12 \text{ inches}} = 1.5 \text{ feet}$

Now multiply the size (area) of your rain garden determined from the Rain Garden Sizing Chart on page 20 by the rain garden soil depth to get soil volume in cubic feet. Multiply the rain garden soil volume by 70% because the size (area) in the table is the surface of ponding depth, so the rain garden soil surface will be 6 inches lower and the sides are sloped.

### EXAMPLE:

- Rain garden size is 100 square feet
- Rain garden soil depth is 18 inches or 1.5 feet
- $100 \text{ square feet} \times 1.5 \text{ feet} = 150 \text{ cubic feet}$
- There are 27 cubic feet in 1 cubic yard, so  $150 \text{ cubic feet} / 27 \text{ cubic feet} = \text{approx. } 5.5 \text{ cubic yards}$
- $5.5 \text{ cubic yards} \times 70\% (0.70) = \text{approx. } 3.9 \text{ cubic yards}$
- Round up to 4 cubic yards because vendors only supply by 1- or 0.5-yard increments
- Add 20% for overage (*multiply final amount by 1.2*)

## OPTION 2—EXCAVATE AND AMEND SOIL FOR REUSE

Option 2 should be used when you have moderately draining soils without too much clay (see the Rain Garden Sizing Chart on page 20 for definition of moderate-draining soils). Excavate the soil and set it aside to mix with compost on-site.

### Excavation Depth Example and Mixing Instructions:

- 6" overflow containment (*assuming no berm is constructed above existing ground surface*)
- + 6" ponding depth
- + 18" rain garden soil mix (*created on-site*)

---

- = 30" excavation depth



Patricia Pyle

## OPTION 2 (CONTINUED)

For mixing rain garden soil under Option 2, use one of the following methods:

1. If digging down from existing ground surface on fairly flat ground, you typically will only reuse approximately 2/3 of the excavated soil. For this reason, consider making 2 piles—one pile with 2/3 of the excavated soil and one pile with 1/3 of the excavated soil. Mix approximately 1/3 compost by volume into the larger pile of excavated soil and place back in the rain garden. The remaining soil will need to be disposed of off-site or used somewhere else on your property.
2. If constructing a berm, mix in approximately 1/3 compost by volume into all the excavated soil and place the mix back in the rain garden and use the remainder to create the berm. With this method, you may be able to use all of the excavated soil, avoiding the need for off-site disposal. Firmly compact the sides of the berm as it is constructed (see page 37 for more information on constructing the berm).

### DON'T ADD SAND TO SOILS WITH HIGH CLAY CONTENT



Adding sand to soils with lots of clay can create a concrete-like mixture.

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**OPTION 3—AMEND SOIL IN PLACE**

Option 3 can be used if you have moderate to well-draining soil with minimal clay content and a soil drainage rate of more than 2 inches per hour. Excavate to the desired ponding depth (6 inches to 12 inches), plus overflow containment (6 inches), plus 3 inches below that to make room for adding compost. Set the excavated soil aside. Spread 3 inches of compost and till to a depth of 4 to 5 inches. Adding compost will help your rain garden plants adapt and thrive.

**Excavation Depth Example:**

- 6" overflow containment (*assuming no berm is constructed*)
- + 6" ponding depth
- + 3" of compost (*tilled into existing soil*)

---

- = 15" excavation depth

**ROUGH UP THE BOTTOM**



Avoid compaction of the bottom of the rain garden especially if the soil is wet (e.g., do not drive machinery such as a mini-excavator in the bottom of the rain garden). Then, before adding rain garden soil mix, use a rake, shovel, or rototiller to rough up (scarify) the bottom of the excavated area. Loosening the soil at the bottom of the excavated area will enhance drainage and promote root growth.

**Choose Compost Carefully**

Compost should be stable and mature and made from organic waste materials such as yard debris or wood wastes. Don't use mushroom compost, uncomposted manure, pure bark, or sawdust. Mushroom compost can be too high in nitrogen and give the soil mix an undesirable texture. Manure can introduce pathogens in the rain garden as well as be too high in nitrogen and salt content. Bark and sawdust will likely lead to a shortage of nitrogen.

A simple way to judge compost quality is to smell and examine the finished product, which should have the following characteristics:

- » Earthy smell that is not sour, sweet, or ammonia-like.
- » Brown to black in color.
- » Crumbly texture with mixed particle size.
- » Stable temperature that doesn't get hot when re-wetted.

**DISPOSING OF YOUR EXCAVATED SOIL**



Under any of the rain garden soil options, you usually will have excess soil. You may be able to use the soil to create a berm around the outside of your rain garden (see page 37 for more information on constructing a berm). If you will not be reusing the soil, find an acceptable disposal site. Contact your local city or county for information (many facilities recycle discarded soil to make topsoil).



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## Avoid Soil Compaction in the Rain Garden

If using a mini-excavator or other machinery for excavation, keep equipment away from the bottom of the rain garden. Operating machinery inside the rain garden will compact the soil and reduce the drainage rate. Instead, operate the machinery from adjacent areas outside the rain garden and use plywood to protect areas such as lawn from compaction and damage.



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Linda Andrews

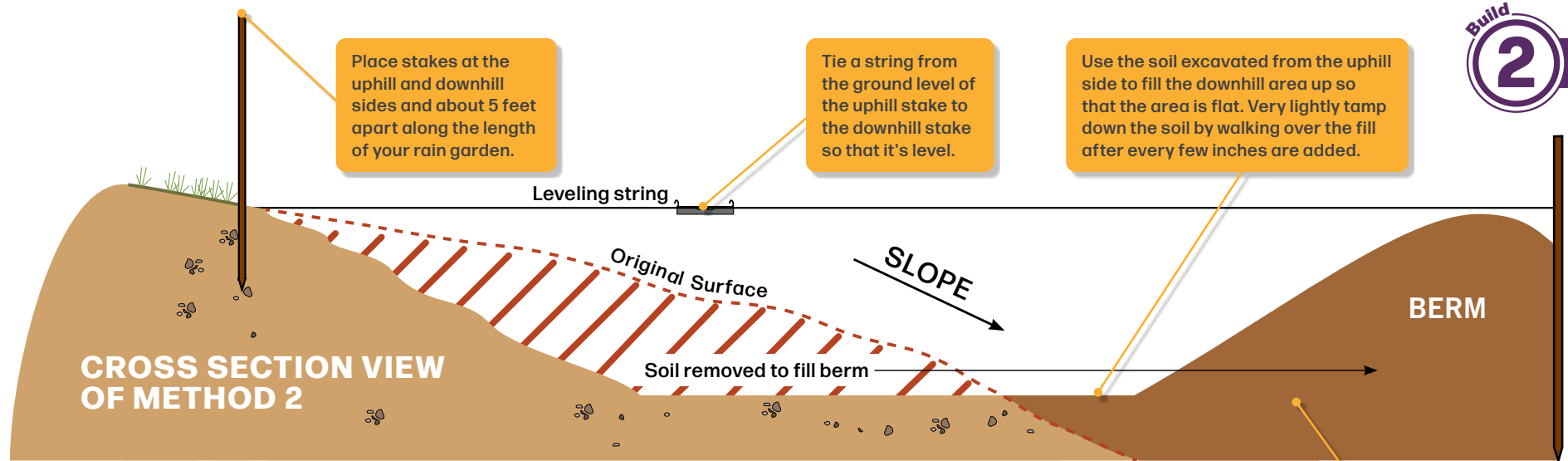
## Excavating on Fairly Flat Ground

If the rain garden is installed on fairly flat ground (5% grade or less), excavate soil to the desired depth. Set soil aside and see instructions for replacing soil on pages 31 through 33.



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## Excavating On Slopes

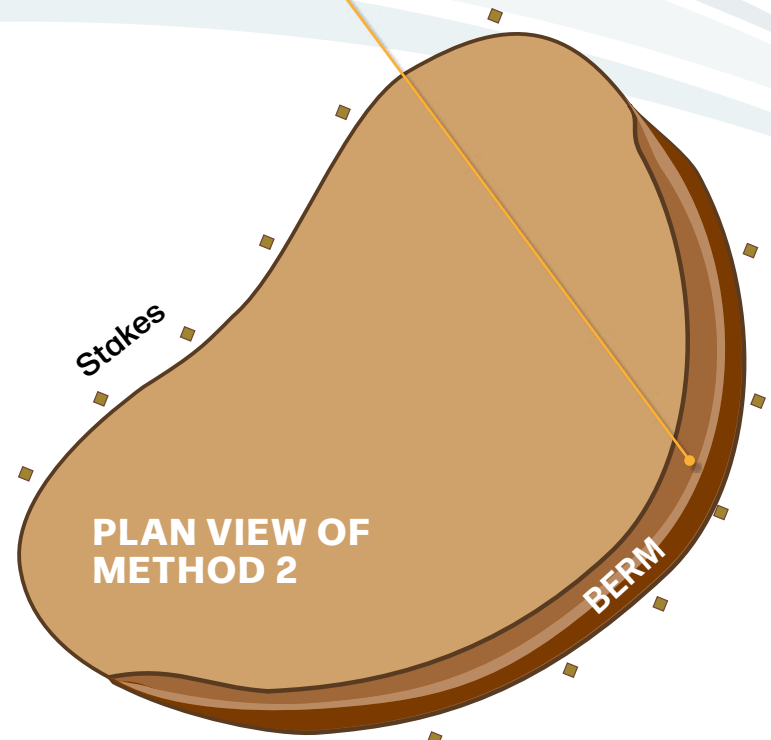
If the slope is greater than 10% consult with a geotechnical engineer to avoid any undesired settling of the ground. If the slope is between 5 and 10%, then consider one of the following methods for excavating soil to the necessary depth:

**METHOD 1:** Dig the downhill side to the desired depth and create a flat bottom. This means you will dig down farther at the uphill than the downhill end. Set the soil aside for reuse and/or disposal if necessary.

**METHOD 2:** An alternative method (shown on this page) to get the desired depth on slopes is to excavate soil from the uphill end and use the soil to fill and create a berm to get the desired depth at the downhill end. If you choose this method, do the following:

- » Place stakes at the uphill and downhill sides and about 5 feet apart along the length of the rain garden.
- » Tie a string from the ground level of the uphill stake to the downhill stake so that it is level. A small, lightweight line level works well for this.
- » Rather than tie all strings to the stakes at once, work with one at a time and in 5-foot sections so that the strings don't get in your way.

Create a berm at the downhill side to confine water in the rain garden. For the correct height, build the berm up to the string.



# Constructing the Overflow Containment Area

## METHOD 2 (continued from page 35):

- » Start digging on the uphill side, measuring down from the string to the desired depth.
- » Use the soil excavated from the uphill side to fill the downhill area, creating a flat, level bottom and a berm on the downhill side.
- » Lightly tamp down the soil on the level bottom by walking over the fill after every few inches are added, avoiding over compaction.
- » Create a more heavily compacted berm at the downhill side to confine water in the rain garden. For the correct height, build the berm up to the string. The berm should have sloping sides at 2:1 maximum and be well compacted. See page 37 for more details to construct a berm.

The overflow containment area is the area around the perimeter of the rain garden that is above the overflow outlet.

The overflow containment area can be constructed by following one of these two approaches depending on whether you are constructing a berm or not:

1. **BUILD BERM UP FROM GROUND SURFACE** - Excavate down from the existing ground surface to accommodate the rain garden soil and ponding depth. Then build a berm up from the ground surface to a minimum of 6 inches high for the overflow containment area (see photo on bottom left).
2. **NO BERM** - Dig down from the ground surface to accommodate the rain garden soil, ponding depth and overflow containment area. Remember to start 12 inches out from the perimeter of the top surface of the ponding area to accommodate the 6-inch overflow containment area on a 2:1 slope (photo on bottom right).



Michael Carey



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## If a Berm is Used to Hold Water in the Rain Garden

- » Water flowing into the rain garden can erode the berm if the soil is loose and unprotected, so pack the berm with firm foot pressure, mulch, and plant fast-growing groundcovers and low shrubs. Refer to the Plant List in Appendix A.
- » Before the soil is placed remove all vegetation and rough up the ground under the berm so the fill bonds well to the ground surface. As the berm is constructed, be sure to firmly compact the soil after every few inches are added.
- » The berm should be at least 6 inches above the maximum ponding depth to provide the overflow containment area, have a maximum slope of 2:1, and be at least twice as wide as it is high at the base.
- » Armor the overflow area with rock where it extends through the berm to protect it from erosion (see page 41).

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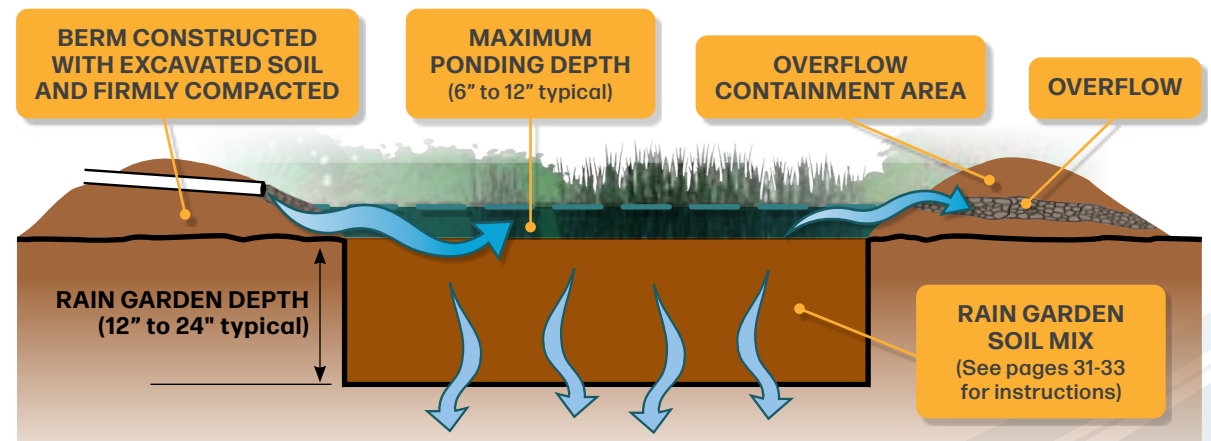
### THE BERM MUST BE WATER TIGHT



A sandy soil that drains well isn't the best material for a berm around the rain garden. The berm needs to hold water after heavy rainfall or frequent storms. Consider bringing in soil with higher clay or silt content that is less well-draining to construct the berm if your soil is very sandy. Before the soil is placed, remove all vegetation and rough up the ground under the berm. As the berm is constructed, be sure to firmly compact the soil after every few inches are added, but do not compact the bottom of the rain garden.

# Building a Rain Garden with Vertical Sidewalls

Typically, rain gardens are constructed with sloped sidewalls. The advantage to sloped sidewalls is they are easy for a mini-excavator to construct and, importantly, steep sidewalls tend to cave in if your soil is loose and sandy. However, if your soil is firm and not too sandy or loose, building your rain garden with vertical sidewalls can be a good option, especially if you do not have much space.



To build a rain garden with vertical sidewalls follow all the instructions provided on the previous pages with two differences:

1. Determining the perimeter of the rain garden: page 23 describes laying out your rain garden and accounting for sloped sidewalls. In those instructions the rain garden perimeter is laid out larger than the area determined from the sizing chart on page 20. If building using vertical sidewalls, the perimeter is laid out 12 inches *less* than the area determined in the sizing chart (using a 2:1 slope) because the berm is built up from the ground surface and sloping away from the excavated rain garden area to form the overflow and maximum ponding depth.
2. The overflow and overflow containment area will always be constructed using a berm. To form the berm use the extra soil from excavation and blend with compost (remember not to use soil that is too sandy and loose). Use the blended soil to form the berm from the ground surface up shaping it to form the overflow channel and overflow containment area. See graphic.



Kim Gridley



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# Create a Flat, Level Bottom

Your rain garden should have a flat, level bottom. An easy way to determine if the bottom is flat is to use a straight board with a carpenter's level on top. Place the board at different locations and in various directions and dig or fill areas to get the bottom flat. A laser level can be used for this as well.



Erica Guttman



Curtis Hinman



Erica Guttman

## HOW TO USE A LASER LEVEL

1. Set the level up just outside of the work area so it is out of the way of construction and has an unobstructed view of the entire rain garden and the planned inflow and overflow locations.
2. For fairly level ground, place the receiver on the measurement rod at a height equal to the distance from the laser to the ground, plus the desired depth of excavation. Excavate the rain garden to the depth the receiver beeps.
3. With Method 1 for "Excavation on Slopes" place the receiver on the measurement rod at a height equal to the distance from the laser to the ground, plus the desired depth of excavation at the downhill end. Excavate the entire bottom of the rain garden to the depth that the receiver beeps.
4. With Method 2 for "Excavation on Slopes" place the receiver on the measurement rod at a height equal to the distance from the laser to the ground, plus the desired depth of excavation at the downhill end. Excavate the up-slope and fill the down-slope areas to the depth that the receiver beeps.

## Install the Inflow

Install any pipes, roof downspout extensions, or other features that will carry water to your rain garden. This should be done at the end of excavation and before placing your rain garden soil mix. Install pipes so that they slope toward the rain garden for the most efficient water flow. Downspouts and waterworks designed as attractive garden elements and art features can add a nice touch. Don't use flexible pipe to deliver water to the rain garden. Rigid pipe is easier to maintain and doesn't settle as much over time, which can impede drainage. Pour water in at the uphill end of the delivery pipe or swale to test that water flows freely to the rain garden and adjust placement as necessary before permanent installation. Remember, if water is directed through a swale sloping more than 2%, consider providing small rock check dams every 5 to 10 feet to slow the water (see photo on bottom left).



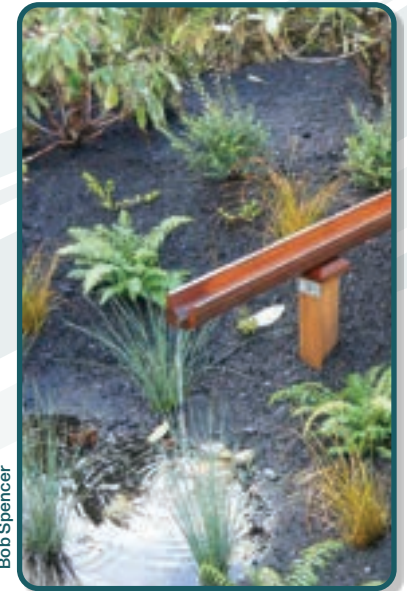
Erica Guttman



Bob Spencer



Bob Spencer



# Place the Rain Garden Soil Mix

Place the soil mix in the rain garden about 6 inches at a time and walk on each layer to lightly tamp down. Fill the soil up to a level that provides the desired ponding depth (6 to 12 inches is recommended) and overflow containment area (minimum 6 inches above overflow). Be sure to keep the bottom of your rain garden flat and level.



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# Protect the Inflow and Overflow



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Erica Guttman

Where water enters the rain garden from a swale or pipe, and where water exits at the overflow, place a pad of rock to slow the water and guard against erosion. For both the inflow and overflow, use round rock (cobble or river rock) that is minimum 2 inches in diameter. The rock should be free of sediment, so order washed rock. If the overflow is through a berm, be particularly careful to armor the overflow with extra rock and extend the rock all the way down the slope and a minimum of 4 feet beyond the berm to prevent erosion.

# Edging

Edging will help separate the rain garden from other surrounding landscapes and reduce encroachment of lawn into the rain garden. Edging comes in many forms, including pavers, plastic, flagstone, metal, and other materials. Alternatively, if you don't want to use edging, cut a sharp line between the rain garden edge and the lawn with a spade during the growing season to prevent grass from spreading into the rain garden, or simply locate the rain garden away from lawn if possible.

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KC Native Plant Guide



Wikipedia Commons



KC Native Plant Guide



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KC Native Plant Guide





# Mulch

Mulch provides multiple benefits for rain gardens by helping to:

- » Keep the soil moist.
- » Replenish organic material in the soil.
- » Prevent erosion.
- » Discourage weeds.

## When to Apply Mulch in a Newly Constructed Rain Garden

Mulch can be applied before or after planting depending on the construction and planting schedule. Mulch can help prevent soil compaction during planting; however, the layer of shredded or chipped wood can be difficult to work around when digging and placing plants. Consider the following:

- » If, after construction, the rain garden will remain unplanted through winter, then mulch before winter rain to prevent erosion and weed establishment.
- » If mulch is applied before planting, be careful not to allow many chips to fall into each planting hole. Excessive wood mulch in the planting hole can create nutrient deficiency for the new plants.
- » If you will plant soon after your rain garden is built, mulch can be applied after planting. Use wood or thick cardboard to step and kneel on while planting to prevent soil compaction as much as possible.
- » See Chapter 4 (Maintenance) for guidance on when to re-apply mulch for maintaining your rain garden.



## What to Apply

Mulch should be shredded or chipped wood from trees and shrubs (see photo at lower right). Mulch can also be purchased from landscape suppliers. A great mulch to use is animal friendly hog fuel which is coarse, shredded wood from trees and shrubs used for livestock bedding (see photo upper left). Avoid using mulch that has been stockpiled for extended periods of time since it may contain weed seeds. Local tree services (arborists) can be a good source of free shredded or chipped mulch. Visit [www.chipdrop.com](http://www.chipdrop.com) to learn more.



Curtis Hinman

### HOW MUCH MULCH?



About 1 cubic yard of mulch, spread 3 inches thick, will cover about 100 square feet.



dirtexchange.us



### MULCH SHOULD NOT BE:

- » **Grass clippings**—decomposing grass clippings are a source of excess nutrients that can harm streams and wetlands if water flows out of the rain garden and into the storm drain system, ditch, stream, lake or water body.
- » **Pure bark, beauty bark or cedar chips**—bark is not as good a source of organic material for replenishing soil and cedar chips are resistant to decomposition.

## How to Apply

Spread 2 or 3 inches of mulch all throughout your rain garden, including on the bottom, the sides, and around the perimeter. Keep mulch 1 to 2 inches away from tree trunks and don't mound around the base of plants.

Selecting the right plants for your rain garden can be fun. This section of the handbook provides important considerations related to landscaping your rain garden.

# Plant

# 3



## IN THIS SECTION

- Prepare to landscape your rain garden
- The benefits of plants
- Planting zones
- Landscape guidelines and suggestions
- Sample planting plans

# Prepare to Landscape Your Rain Garden

Obtain your plants and gather the tools and materials you'll need to start landscaping your rain garden. Remember that you may need to order your plants from the nursery or other sources ahead of time. Be sure to choose a variety of plants for year-round interest and color as well as bird and insect habitat. See Plant List in Appendix A for ideas.

## TOOLS & MATERIALS CHECKLIST



- PLANTS

---

- STONES/ROCKS

---

- HAND TOOLS  
*(trowel, weeding knife, dibble, or planting bar)*

---

- RAKE

---

- SHOVEL

---

- WHEELBARROW

---

- WATER

---

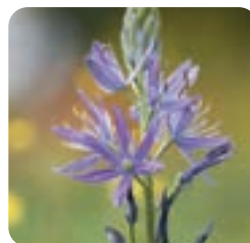
- MULCH  
*(shredded or chipped hardwood or softwood)*



Patricia Pyle



Rain Dog Designs



Rod Gilbert



Wikipedia Commons



Rain Dog Designs

# The Benefits of Plants

Plants and soil work together in the rain garden. The plant roots and soil organisms build soil structure, create channels and pores to soak up and filter water, and improve nutrient and oxygen availability necessary to support an abundance of life. While plants help build soil structure, support microorganisms, and improve how well stormwater soaks into the rain garden, they also create an attractive landscape for your yard and neighborhood. For sample planting plans see pages 52 through 56 and refer to Appendix A for a recommended plant list.

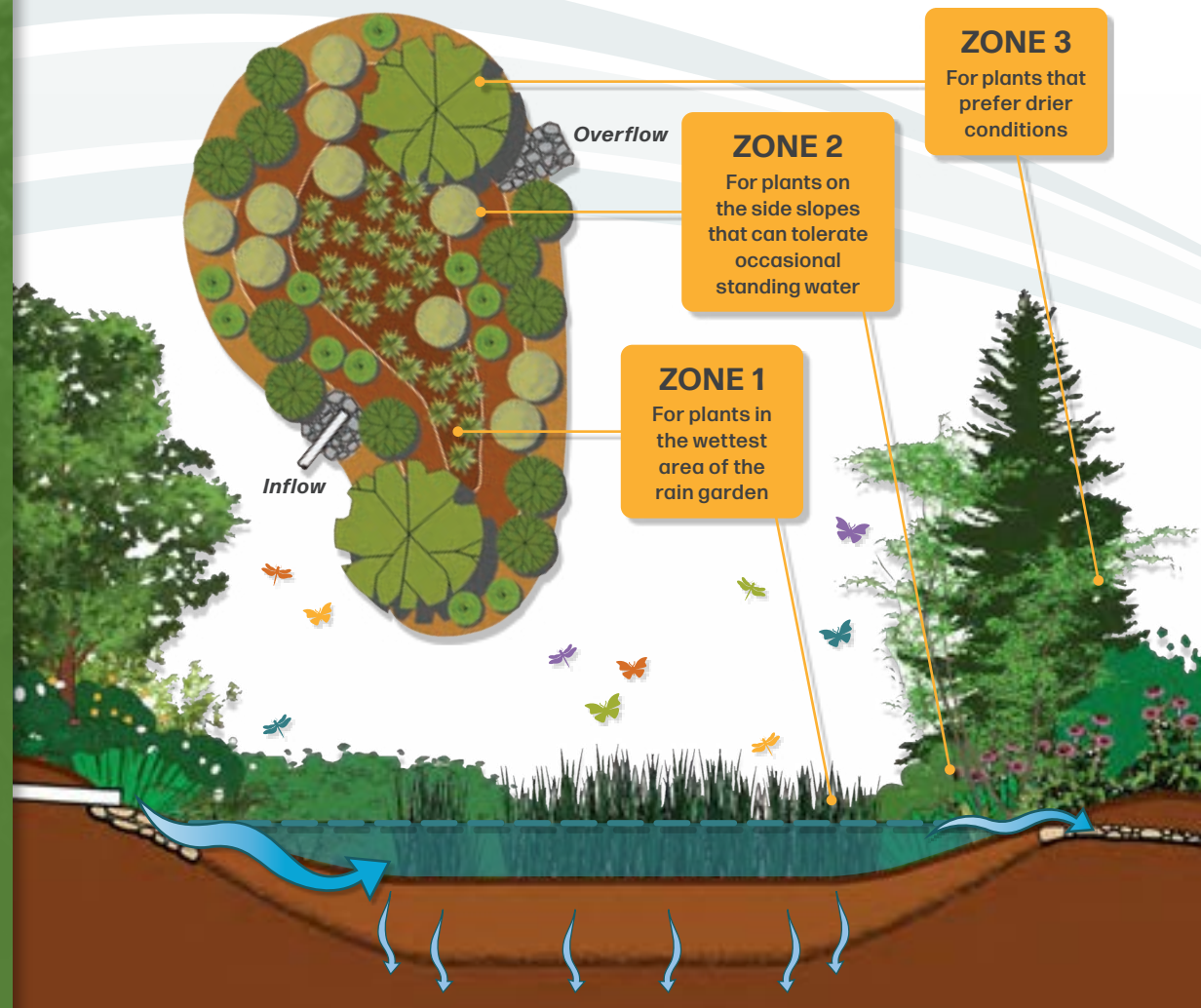
## PLANT SELECTION RESOURCES



There are many great resources for plant selection and landscaping in addition to the plant recommendations in this handbook. For a good list of native plants check out [www.kingcounty.gov/gonative](http://www.kingcounty.gov/gonative) and for plant lists to support pollinators go to [www.xerces.org/publications/plant-lists/native-plants-for-pollinators-and-beneficial-insects-maritime-northwest](http://www.xerces.org/publications/plant-lists/native-plants-for-pollinators-and-beneficial-insects-maritime-northwest).

# Planting Zones

Rain gardens have three planting zones. Zone 1 is the bottom of the rain garden (the wettest area). This area requires plants that can be in wet soil much of the winter but also survive mostly drier conditions in the summer. Zone 2 covers the side slopes, which occasionally may become wet. This zone requires plants to help stabilize the slopes. Zone 3 covers the area around the perimeter of the rain garden and/or on the berm, where plants will grow in drier soil.



# Landscaping Guidelines and Suggestions



The following provides guidelines for plant selection, siting, and spacing as well as visual interest and maintenance.

## General

- » Existing trees and plants already do a great job soaking up stormwater, so preserve existing vegetation around your rain garden as much as possible. Remember, to adequately protect tree roots, be careful to not disturb soil at least 1-foot away from the trunk for every 1-inch of tree trunk diameter. For example, if the tree is 6-inches in diameter, do not disturb the soil within a circle that has a 6-foot radius around the trunk. See page 29 for more detail on measuring the tree root protection area.
- » Consult with an expert (landscape architect, garden designer, arborist, nursery professional, and/or other specialist) if you need assistance with planting design and preservation of existing trees and vegetation.



Erica Guttman



Erica Guttman



Patricia Pyle

## INCLUDE SOME EVERGREENS FOR YEAR-ROUND BENEFITS



Include a mix of evergreens and deciduous plants in your rain garden. Evergreens will provide year-round greenery and shade, which will reduce weed growth and maintenance.

## RAIN GARDENS ARE NOT PLACES TO GROW FOOD



Remember that rain gardens help to filter pollutants, and they are not suitable as vegetable gardens. You also should avoid eating berries, nuts, and other edibles that may be growing in a rain garden.

Rain Dog Designs



Erica Guttman



Erica Guttman



## Plant Selection, Siting, and Spacing

- » Consider a mix of deciduous and evergreen plants (trees, shrubs, and groundcover) to provide good coverage and a layered, all-season visual interest.
- » Carefully choose plants with their eventual mature size in mind. The rain garden soil mix provides an excellent growing medium, so plan on most plants reaching their mature width and height perhaps more quickly than in other locations. Space trees, shrubs, and plants at their mature spread.
- » Plants that are too large can require more maintenance later, such as pruning and thinning, so choose the right-sized plants from the start.
- » If your rain garden is near a roadway, driveway, or intersection, make sure the mature plants won't block drivers' vision.
- » If your rain garden is located under overhead power and utility lines, be sure to comply with maximum height requirements for trees.
- » If there are underground utilities near the rain garden and you are including trees and shrubs, select smaller, slower growing species that are adapted to drier sites to minimize intrusion into pipes (cracked water and sewer pipes or pipes with leaky joints may be particularly susceptible to root intrusion).
- » In areas with heavy deer traffic, look for deer resistant plants and plan to protect plants until they can mature sufficiently to withstand browsing.
- » Check out local rain gardens that have been installed for a few years to get ideas.
- » Plan ahead for plants. Inquire with your local nurseries about ordering and receiving plants in time for your planting schedule.

Rain Dog Designs





## Good Plants for Attracting Hummingbirds, Butterflies, Bees, Other Birds, and Insects

COMMON NAME	Scientific Name
Western serviceberry	<i>Amelanchier alnifolia</i>
Red-twig dogwood	<i>Cornus sericea</i>
Purple coneflower	<i>Echinacea</i>
Cascara	<i>Frangula purshiana</i>
Lavender	<i>Lavendula</i>
Oregon grape	<i>Mahonia</i>
Mock orange	<i>Philadelphus lewisii</i>
Pacific ninebark	<i>Physocarpus capitatus</i>
Red-flowering currant	<i>Ribes sanguineum</i>
Salmonberry	<i>Rubus spectabilis</i>
Black-eyed susan	<i>Rudbeckia</i>



Rod Gilbert

## Visual Interest and Compatibility

- » Incorporate a diversity of plants, including small trees, shrubs, herbs, emergents (sedges, rushes, and bulrushes), and grasses for year-round/seasonal color and interesting differences in height and texture.
- » Consider the context of the surrounding landscape, including your neighborhood and the local native plants.
- » Choose plants that complement the character of your existing landscape. If your yard is more natural and informal, you may choose more native plants. If your yard is more formal, you may prefer plants that are more ornamental and compact.
- » Native plants and ornamentals also can be mixed, resulting in an attractive garden.
- » Arrange landscaping according to your view of the rain garden. If you want to see the water after a rainstorm, leave a view corridor open to the ponding area.
- » Consider plants that provide a pleasing visual buffer between homes and roadways. For example, there are several attractive evergreen shrubs that perform well in Western Washington (see the Plant List in Appendix A).



## Maintenance

- » Maintain access to the bottom of the rain garden for weeding and other tasks. A few strategically placed flat rocks can allow access to the bottom of the rain garden without compacting the soil.
- » Use edging around the rain garden (such as pavers, stones, etc.) to facilitate access for maintenance and provide separation from lawn and other landscaped areas.
- » Prune trees and shrubs as necessary to maintain sight distances at sidewalks and roads. In fall, cut back dead vegetation to promote new spring growth.
- » Refer to Chapter 4 (Maintain) for more information.



Erica Guttman

### THE BENEFITS OF NATIVE PLANTS



Native plants are already adapted to the region and will use less water and require less maintenance once established. They also can provide habitat for wildlife.

## Good Plants for Seasonal Color

COMMON NAME	Scientific Name
Orange New Zealand sedge	<i>Carex testacea</i>
Cornelian cherry	<i>Cornus mas</i>
Red-twig dogwood	<i>Cornus sericea</i> , C. s. 'Midwinter Fire', C. s. 'Kelsey' (all varieties)
Oregon grape	<i>Mahonia (all)</i>
Persian ironwood	<i>Parrotia persica 'Vanessa'</i>
Pacific ninebark	<i>Physocarpus capitatus</i>
Western sword fern	<i>Polystichum munitum</i>
Snowberry	<i>Symphoricarpos albus</i>
Evergreen huckleberry	<i>Vaccinium ovatum</i>

King County Native

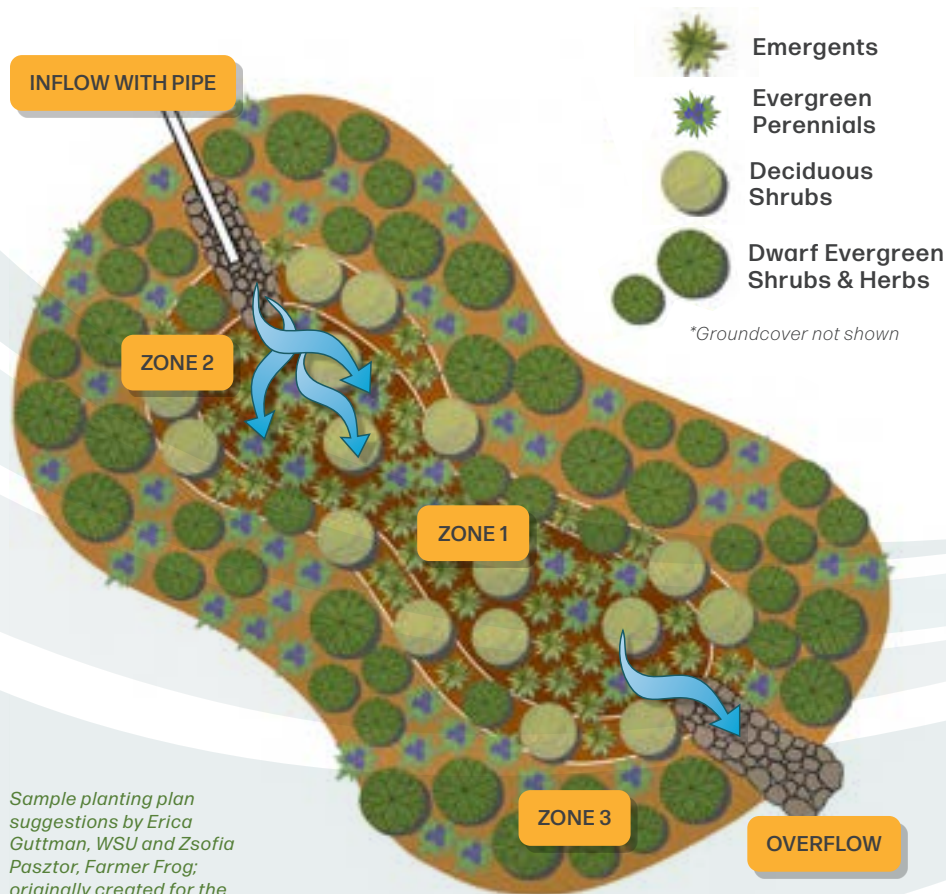


Patricia Pyle

# Sample Planting Plans

## Sunny & Tidy Rain Garden

This sample planting plan represents just one of many approaches to landscaping a rain garden. The creative possibilities are many when selecting plants for your rain garden. Refer to the Plant List in Appendix A for additional ideas. Note that some Zone 3 options are not included in Appendix A, but resources in Appendix B will provide additional information as you research options.



Sample planting plan suggestions by Erica Guttman, WSU and Zsofia Pasztor, Farmer Frog; originally created for the 2007 handbook and updated for this edition.

### SUGGESTED PLANTS

#### ZONE 1

##### Emergents (evergreen)

*Juncus* 'Elk Blue' (Elk Blue Rush)

##### Emergents (deciduous)

*Juncus acuminatus* (Tapertip Rush)

##### Low shrubs (deciduous)

*Spiraea lucida* (or *Spiraea betulifolia* 'Tor') (Shiny-leaf Spirea)

##### Perennials (semi-evergreen)

*Iris tenax* (Oregon Iris)

#### ZONE 2

##### Emergents (evergreen)

*Carex testacea* (Orange Sedge),  
*Carex oshimensis* EverColor® 'Everlime'  
(Everlime Japanese Sedge)

##### Low shrubs (evergreen)

*Mahonia aquifolium* 'Compacta' (Dwarf Tall Oregon-grape), *Lonicera pileata* 'Little Lemon Zest' (Dwarf Boxwood Honeysuckle)

##### Low shrubs (deciduous)

*Spiraea japonica* (Japanese spirea, dwarf cultivar)

##### Groundcover (evergreen)

*Rubus calycinoides* (Creeping Raspberry)

#### ZONE 3

##### Dwarf evergreen shrubs & herbs

*Helianthemum nummularium* (Sunrose),  
*Teucrium chamaedrys* (Germander),  
*Hyssopus officinalis* 'Nana' (Blue Hyssop),  
*Ilex crenata* 'Lemon Gem' (Lemon Gem Japanese Holly), *Lavandula angustifolia* (English Lavender)

##### Perennials (evergreen)

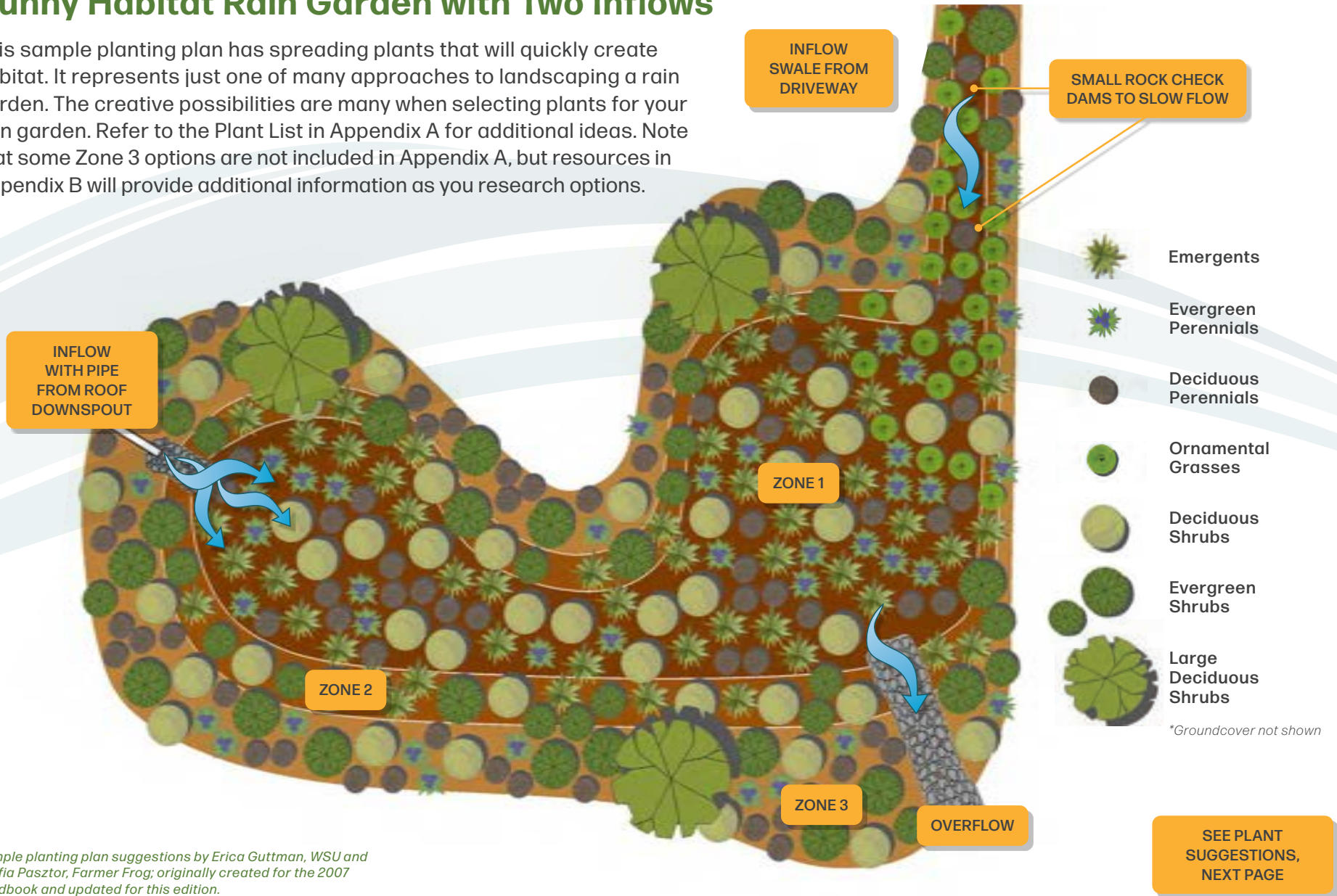
*Geum* 'Mango Lassi' (Evergreen Geum)

##### Groundcover (evergreen)

*Rubus calycinoides* (Creeping Raspberry)

## Sunny Habitat Rain Garden with Two Inflows

This sample planting plan has spreading plants that will quickly create habitat. It represents just one of many approaches to landscaping a rain garden. The creative possibilities are many when selecting plants for your rain garden. Refer to the Plant List in Appendix A for additional ideas. Note that some Zone 3 options are not included in Appendix A, but resources in Appendix B will provide additional information as you research options.



Sample planting plan suggestions by Erica Guttman, WSU and Zsofia Pasztor, Farmer Frog; originally created for the 2007 handbook and updated for this edition.

## SUGGESTED PLANTS FOR THE RAIN GARDEN ON PAGE 53

### ZONE 1

<b>Emergents (evergreen)</b>	<i>Carex obnupta</i> (Slough Sedge)
<b>Emergents (deciduous)</b>	<i>Scirpus microcarpus</i> (Small-fruited Bulrush)
<b>Perennials (deciduous)</b>	<i>Sidalcea hendersonii</i> (Henderson's Checkermallow), <i>Symphytotricum subspicatum</i> (Douglas Aster)
<b>Perennials (evergreen)</b>	<i>Iris douglasiana</i> (Douglas Iris)
<b>Low shrubs (deciduous)</b>	<i>Cornus s. 'Kelseyi'</i> (Dwarf Red-twig Dogwood), <i>Aronia melanocarpa</i> Low Scape Mound® (Low Scape Mound® Chokeberry)

### ZONE 2

<b>Emergents (evergreen)</b>	<i>Carex testacea</i> (Orange Sedge), <i>Carex buchananii</i> (Leatherleaf Sedge)
<b>Low shrubs (evergreen)</b>	<i>Lonicera pileata</i> 'Little Lemon Zest' (Dwarf Boxwood Honeysuckle), <i>Mahonia aquifolium</i> 'Compacta' (Dwarf Tall Oregon-grape)
<b>Low shrubs (deciduous)</b>	<i>Symphoricarpos albus</i> (Common Snowberry)
<b>Groundcover (evergreen)</b>	<i>Fragaria chiloensis</i> (Coastal Strawberry)

### ZONE 3

<b>Low shrubs (deciduous)</b>	<i>Spiraea japonica</i> Dwarf Cultivars (Dwarf Japanese Spirea)
<b>Low shrubs (evergreen)</b>	<i>Rosmarinus officinalis</i> - hardy cultivars such as 'Tuscan Blue,' 'Madeline Hill' (Hardy Rosemary)
<b>Large shrubs (deciduous)</b>	<i>Ribes sanguineum</i> (Red-flowering Currant), <i>Holodiscus discolor</i> (Oceanspray)
<b>Perennials (deciduous)</b>	<i>Achillea cultivars</i> (Yarrow), <i>Aquilegia formosa</i> (Western Columbine), <i>Erigeron speciosus</i> (Showy fleabane)
<b>Perennials (evergreen)</b>	<i>Bergenia</i> spp. cultivars (Elephant Ears), <i>Geum</i> 'Totally Tangerine' (Evergreen Geum)
<b>Groundcover (evergreen)</b>	<i>Fragaria chiloensis</i> (Coastal Strawberry)



Erica Guttman

## PLANTS TO LINE A SUNNY SWALE INFLOW ON PAGE 53

### ZONE 1

<b>Emergents</b>	<i>Juncus</i> 'Elk Blue' (Elk Blue Rush), <i>Juncus ensifolius</i> (Daggerleaf-Rush)
------------------	---

*Note: You can plant the bottom of your inflow swale as long as your inflow energy is moderate or is modified with check dams. Place the plants carefully within rock armoring to protect them during storms.*

### ZONE 2

<b>Emergents</b>	<i>Carex testacea</i> (Orange Sedge)
<b>Clumping grass</b>	<i>Molinia caerulea</i> 'Moorhexe' (Moorhexe Moor Grass)

### ZONE 3

<b>Clumping grass</b>	<i>Pennisetum alopecuroides</i> - named cultivars (Fountain grass cultivars), <i>Miscanthus sinensis</i> 'Little Kitten' (Dwarf Maidengrass)
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*Note: Place these grasses and sedges in Zones 2 and 3 in attractive groups to mimic the edge of a natural pond or stream.*

## Shady Rain Garden

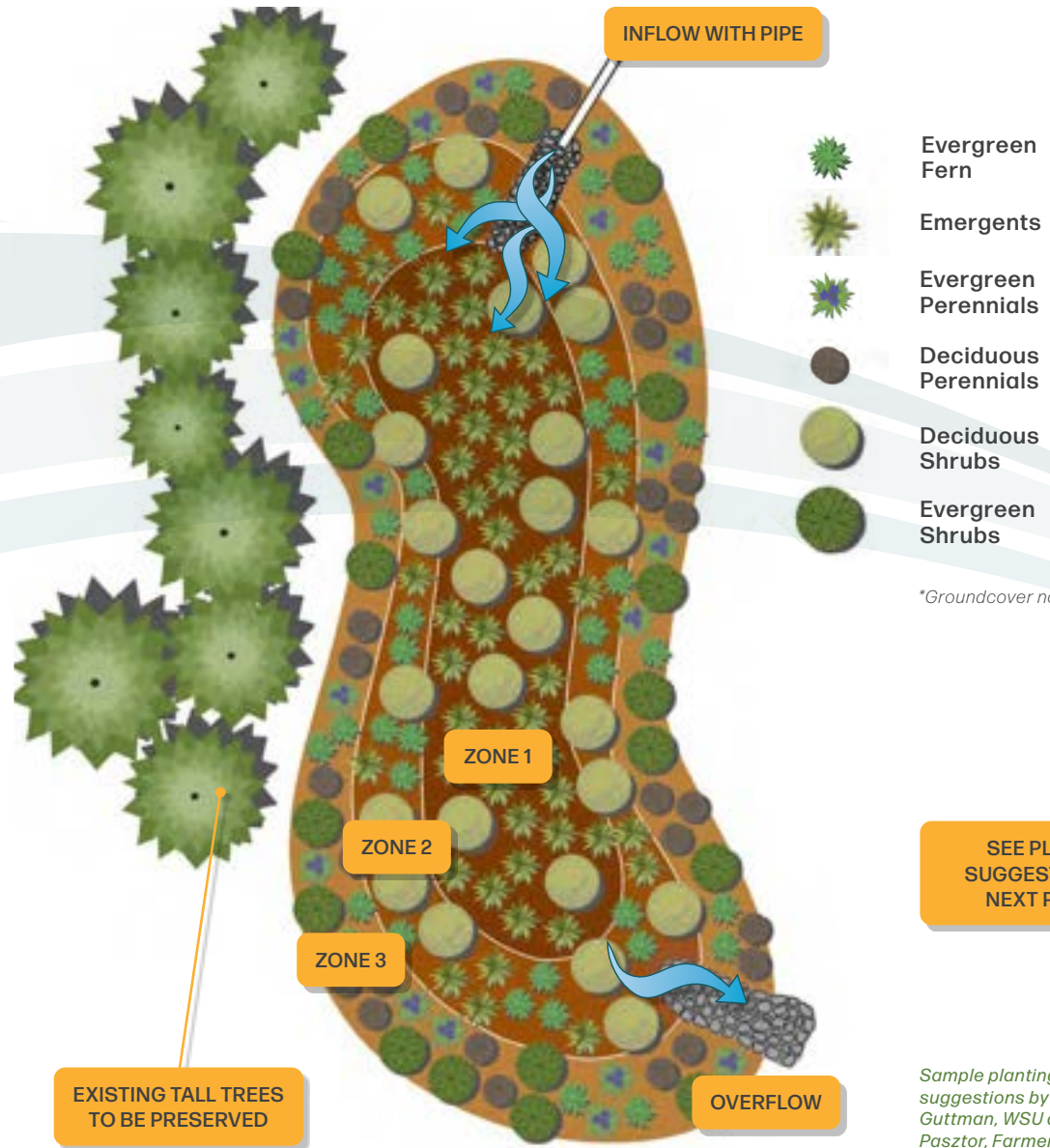
This sample planting plan represents just one of many approaches to landscaping a rain garden. The creative possibilities are many when selecting plants for your rain garden. Refer to the Plant List in Appendix A for additional ideas. Note that some Zone 3 options are not included in Appendix A, but resources in Appendix B will provide additional information as you research options.



Center for Neighborhood Technology



Center for Neighborhood Technology



\*Groundcover not shown

SEE PLANT SUGGESTIONS, NEXT PAGE

Sample planting plan suggestions by Erica Guttman, WSU and Zsofia Pasztor, Farmer Frog; originally created for the 2007 handbook and updated for this edition.



## SUGGESTED PLANTS FOR RAIN GARDEN ON PAGE 55

### ZONE 1

#### Emergents (evergreen)

*Carex oshimensis* EverColor® 'Everest' (Variegated Japanese Sedge), *Carex oshimensis* EverColor® 'Everlime' (Everlime Japanese Sedge), *Carex oshimensis* EverColor® 'Everillo' (Everillo Japanese Sedge)

#### Low shrubs (deciduous)

*Aronia melanocarpa* Low Scape Mound® (Low Scape Mound® Chokeberry)

### ZONE 2

#### Emergents (evergreen)

*Carex testacea* (Orange New Zealand Sedge), *Carex laxiculmis* 'Hobb' (Bunny Blue Sedge)

#### Low shrubs (deciduous)

*Aronia melanocarpa* Low Scape Mound® (Low Scape Mound® Chokeberry), *Itea virginica* Little Henry® (Dwarf Sweetspire)

#### Evergreen Fern

*Polystichum munitum* (Western Sword Fern)

#### Groundcover (evergreen)

*Vancouveria hexandra* (Inside-out Flower)

### ZONE 3

#### Low shrubs (evergreen)

*Vaccinium ovatum* (Evergreen Huckleberry), *Mahonia nervosa* (Low Oregon Grape)

#### Perennials (evergreen)

*Helleborus* (evergreen cultivars) (Hellebore cultivars), *Epimedium* (evergreen cultivars) (Bishop's-hat)

#### Perennials (deciduous)

*Vancouveria hexandra* (Inside-out Flower)

#### Perennials (semi-evergreen)

*Heuchera cultivars* (Coral Bells)

#### Evergreen Fern

*Polystichum munitum* (Sword Fern)

#### Groundcover (evergreen)

*Galium odoratum* (Sweet Woodruff)

Rain gardens, just like any garden area, need maintenance to perform well and look good. There are two key elements to minimize maintenance effort and ensure rain garden performance over time: 1) proper design as outlined in the previous chapters; and 2) regular/routine maintenance steps at strategic times as outlined in this chapter.



## IN THIS SECTION

- Keep the water flowing
- Minimize exposed soil and erosion
- Provide routine maintenance
- Maintenance checklist and troubleshooting guide

# Maintain

# 4

# Keep the Water Flowing

During and after heavy storms is a particularly important time to check your rain garden, especially when new. To keep the water flowing:

- » Check the inflow and overflow areas to make sure they are still intact and can continue to carry water into and out of the rain garden.
- » Remove any debris or litter in the rain garden that may interfere with flow (this is particularly important in fall when leaves are collecting in and around the rain garden).
- » Keep the inflow pipe accessible and flush out pipe if necessary.
- » Look for areas where water may not be soaking into the ground. This may be due to fine sediment or compaction of the soil. Remove sediment that may be building up and rake the soil surface. If you suspect compaction, break up and loosen the soil when it is not saturated.



# Minimize Exposed Soil and Erosion

Rainwater can wash exposed soil into your rain garden. The soil from this erosion (also called sediment when deposited by water) can clog the soil mix and slow drainage. Sediment carried out of the rain garden can harm streams and wetlands in many ways, including transporting pollutants, covering fish spawning areas, and filling stream channels and pools. To guard against soil erosion problems:

- » Check the rain garden for areas of exposed soil, particularly in the fall before the wet season begins, as well as during the winter.
- » Replenish mulch on the sides and bottom of the rain garden, around the perimeter, and on the berm (if applicable). See Section 2 for mulch guidelines.
- » Maintain a healthy cover of plants.
- » Maintain a rock pad (use cobble that is 2 inches or greater) to protect the ground and prevent erosion where concentrated water flows into the rain garden from a pipe or swale.
- » If sediment is deposited from water entering the rain garden, immediately determine the source and stabilize the area.
- » If there is a localized area of erosion, consider stabilizing the area with rocks to spread out the flows causing erosion. If there are already rocks in this area, use larger rocks or cover a larger area.
- » If erosion is occurring at the inflow and overflow locations, you may need to extend the cobble rock in these areas to disperse water flow.
- » If erosion persists, water may be flowing into the rain garden too rapidly. In this case, the slope of the inflow pipe or swale may need to be reduced, or the amount of water flowing into the rain garden may need to decrease. Adding small rock check dams every few feet in the inflow swale can slow water and reduce erosion.



# Provide Routine Maintenance

In the short term (during the first 2 to 3 years), more frequent maintenance will be needed until the plants in your rain garden become established. The following routine activities should be part of your maintenance program.

## Replenish Mulch

Mulch prevents erosion, controls weeds, retains soil moisture, adds organic material to the soil, and improves drainage. Every year check the mulch layer and replenish to maintain a depth of 2 to 3 inches. Spread mulch between plants and on bare ground. Added mulch should be shredded or chipped wood from trees and shrubs. Mulch is best applied in the fall or spring to maintain a sufficient layer for the dry summer and rainy winter months. Avoid using mulch that has been stockpiled for extended periods of time since it may contain weed seeds.

### WHERE TO FIND MULCH



Local tree services (arborists) can be a good source of free shredded or chipped mulch. Visit [www.chipdrop.com](http://www.chipdrop.com) to learn more.



Rain Dog Designs



earthfix.org; Katie Campbell

## Watering

For the first 1 to 3 years, most plants in your rain garden will need deep watering during the dry season to establish healthy root systems. If you have selected the appropriate plants adapted to Western Washington (see guidance on A-2), your rain garden will need little or no watering after 2 or 3 years. However, watering may be necessary during prolonged dry periods even if plants are established. During these periods watch for signs of stress, such as wilting leaves or fading evergreen needles.

## WATER WISELY



- Check soil before watering with a shovel or trowel (soil should be dry 1 to 2 inches below surface before watering).
- Check the plants to see if they are wilting and in need of water.
- Water deeply, but infrequently, so that the top 6 to 12 inches of the root zone is moist.
- Do not over water because this can rot plant roots, and soggy soil reduces oxygen needed for healthy soil and plants.
- Water in the morning or evening to reduce evaporation during warm mid-day temperatures.



## WATERING FREQUENCY (DURING THE DRY SEASON)

### Year 1:

- » During planting and the first week after installation: water plants as soon as they are planted and every other day.
- » From the second week after installation and until fall rains begin: water 2 or 3 times per week (watch for signs of water stress and adjust watering if necessary).

### Year 2:

- » Water deeply about every 1 to 3 weeks depending on your plants and how well-drained the soil is (very well-drained sandy soil will dry out faster than denser silty soil).

### Year 3 and Beyond:

- » Minimal or no water should be needed (e.g., once per month), except during prolonged periods of drought.

These are initial recommendations. Watch your rain garden plants for signs of stress (wilting and brown leaves) and adjust watering as necessary to reduce stress.

## WATERING TECHNIQUES

- » Soaker Hoses
  - Save water (hose can be covered with mulch to save even more).
  - Should be no more than 100 feet in length for effective soaking.
  - Work best if level, so contour the hose on the side slopes and connect the level soakers with solid hose.
  - Should be spaced 12 to 18 inches apart.
- » Sprinklers
- » Wands



## Weeding

More weeding may be needed during the first 1 to 2 years after your rain garden is installed. After 1 to 2 years, weeding should not be as extensive once plants become established and start to cover open soil. Rain gardens will soak up and filter stormwater even if weeds are present. However, the plants will not likely grow as well with all the competition, and your rain garden will not be as attractive.

## Plant Care

Maintaining healthy plants in your rain garden minimizes weeds, improves drainage, and reduces erosion. If certain plants continue to do poorly or fail, they may be the wrong plants for that location. Consider the sun exposure, soil moisture, adjacent plants, and mature size when replacing plants with varieties better suited for that location in the rain garden. You may need to thin out some plants—plants often grow rapidly to full size in rain gardens due to the nutrient rich soil.

Minimal pruning should be needed in your rain garden, but occasionally you may need to:

- » Prune or trim back shrubs to keep sidewalks and sight distances at driveways and along roadways clear.
- » If you find that the same plants need to be trimmed back too frequently, consider replacing with lower-growing alternatives.
- » Remove broken and dead branches and suckers.
- » Clear vegetation growth from water inflow and overflow areas.
- » Cut back perennials and ornamental grasses in late winter before spring perennials and new flower stalks emerge.

### TIPS FOR WEEDING YOUR RAIN GARDEN



- Soils in rain gardens have good structure, so weeds should be easy to pull by hand or with a narrow trowel, especially in the spring when the soil is moist and the weeds are small.
- Dig or pull weeds out by the roots in spring before they go to seed.
- Weed by hand and be careful not to compact the soil in your rain garden. Place a kneeling pad or thick cardboard under you while weeding to reduce compaction. Maintaining a 2-3 inch cover of mulch also minimizes soil compaction when working in your rain garden.
- Need more information on identifying and managing weeds? Go to: [www.portland.gov/bes/green-street-stewards/documents/green-street-steward-weed-identification-guide/download](http://www.portland.gov/bes/green-street-stewards/documents/green-street-steward-weed-identification-guide/download)



## Avoid Fertilizers, Herbicides, and Pesticides

Do not apply fertilizers, herbicides, or pesticides in or near your rain garden. The rain garden soil mix provides plenty of nutrients, and if you have selected the appropriate plants adapted to this region and replenish mulch as needed, no fertilizing will be needed.



## Check Your Berm

If you have a berm around your rain garden, check it for settling and add and compact soil as needed. Cover bare spots with mulch or plants to minimize erosion.

## Clean Up Debris and Sediment

To maintain an attractive year-round rain garden, remove litter and debris. Although natural leaf debris can serve as beneficial compost for the garden, other debris and trash should be removed. Fine sediments can clog the rain garden soil mix and interfere with drainage. Remove sediment, rake the soil, and replenish wood mulch annually to reduce sediment problems.



# Maintenance Checklist

SEASON	TIMING	TASK	OBJECTIVE
<b>FALL</b> (September–November)	<i>Weekly and especially before storms</i>	Check inflow pipes and swale and remove leaves that may block water from entering the rain garden.	Stormwater can freely enter rain garden.
	<i>Early fall</i>	Check inflow and outflow rock pads and add rock (cobble greater than 2 inches) if bare spots.	Prevent erosion at rain garden inlet and outlet.
	<i>Early fall</i>	Check and add mulch as needed (maintain 2-3 inch depth)	<ul style="list-style-type: none"> <li>» Prevent erosion.</li> <li>» Replenish organic matter.</li> <li>» Retain moisture.</li> </ul>
	<i>Late fall</i>	Prune trees, shrubs and grasses (see plant list in Appendix A for guidance on which plants benefit from pruning).	Clean up rain garden and prepare plants to over winter and for new growth in spring.
<b>WINTER</b> (November–March)	<i>During storms</i>	Keep an eye on the inlets and outlets especially if there is a lot of debris from adjacent trees and shrubs. Remove debris.	Water flows freely into and out of rain garden.
	<i>During storms</i>	Look for areas of erosion such as gullies or bare soil. Cover bare soil: <ul style="list-style-type: none"> <li>» In and adjacent to rain garden with mulch.</li> <li>» At inlet and outlet with rock cobbles greater than 2 inches.</li> </ul> Place small rock check dams if erosion persists in swale where water flows into rain garden.	<ul style="list-style-type: none"> <li>» Reduce/eliminate soil from washing into rain garden and clogging rain garden soil mix during storms.</li> <li>» Reduce/eliminate soils washing from rain garden and into streams, wetlands, lakes, and nearshore.</li> </ul>
	<i>Late winter (March)</i>	Remove weeds that emerge early such as bittercress (aka shot weed).	Remove weeds before they go to seed.

SEASON	TIMING	TASK	OBJECTIVE
<b>SPRING</b> (March–May)	<i>All spring</i>	Remove weeds	<ul style="list-style-type: none"> <li>» Remove weeds before they go to seed.</li> <li>» Promote healthy plant growth.</li> <li>» Aesthetically pleasing rain garden.</li> </ul>
	<i>Early spring</i>	Mulch as needed (maintain 2-3 inch depth)	<ul style="list-style-type: none"> <li>» Prevent erosion.</li> <li>» Replenish organic matter.</li> <li>» Retain soil moisture.</li> </ul>
<b>SUMMER</b> (June–August)	<i>All summer</i>	<b>WATER:</b> <ul style="list-style-type: none"> <li>» <b>Year 1:</b> deeply 2 to 3 times/week.</li> <li>» <b>Year 2:</b> deeply every 1 to 3 weeks.</li> <li>» <b>Year 3 and beyond:</b> minimal water needed (e.g., once per month), but watch for signs of stress (wilted leaves), especially during prolonged drought, and water as necessary.</li> </ul>	<ul style="list-style-type: none"> <li>» Establish and maintain healthy plants.</li> </ul>

# Troubleshooting Guide

CONDITION	REMEDY
Visible sediment build-up in rain garden bottom area.	<ul style="list-style-type: none"> <li>» Determine source of sediment.</li> <li>» If bare soil on sides or bottom of rain garden, replenish mulch.</li> <li>» If bare soil in swale where water flows into rain garden, stabilize with rock (cobble greater than 2 inches) and/or rock check dam(s).</li> </ul>
Matted accumulation of leaves in bottom of rain garden.	Remove leaves (check to confirm mulch is 2-3 inches deep after removing leaves).
Ponded water remains in rain garden more than 3 days after storm.	<p>Confirm leaf, debris or sediment buildup is not reducing drainage rate. If present, determine source of sediment. See remedy above for sediment build-up and matted leaves. If this does not solve the problem, consult a professional with rain garden expertise to evaluate the following:</p> <ul style="list-style-type: none"> <li>» Check for other water inputs (e.g., groundwater).</li> <li>» Verify that the rain garden is sized appropriately for the contributing area. Confirm that the contributing area has not increased.</li> <li>» Determine if the soil is clogged by sediment or if the soil is compacted.</li> </ul>
Water is backing up in inlet pipe	Clear pipes of sediment and debris with plumber's snake or flush with hose.
Erosion at inlet or outlet	<ul style="list-style-type: none"> <li>» If exposed soil is present, cover with rock cobble greater than 2 inches.</li> <li>» If erosion persists, remove rock, cover soil with landscaping fabric, and replace rock.</li> </ul>
Excessive weeds	<ul style="list-style-type: none"> <li>» Remove weeds by the roots before they go to seed.</li> <li>» Maintain a 2-3 inch mulch cover.</li> </ul>
Dying, dead or unhealthy plants	<ul style="list-style-type: none"> <li>» If certain plants continue to do poorly or fail, they may be the wrong plants for that location. Consider the sun exposure, soil moisture, adjacent plants, and mature size and replace plants with varieties better suited for that location in the rain garden.</li> <li>» Remove any diseased plants or plant parts and dispose to avoid risk of spreading the disease to other plants.</li> <li>» Disinfect gardening tools after pruning to prevent the spread of disease.</li> <li>» Re-stake trees if they need more support, but plan to remove stakes and ties after the first year.</li> </ul>

CONDITION	REMEDY
Vegetation reduces sight distances for vehicles and sidewalks.	<ul style="list-style-type: none"> <li>» Trim plants to maintain sight distances and keep sidewalks clear.</li> <li>» Chose lower growing plants where sight lines are required (e.g., near road and bike path intersections).</li> </ul>
Vegetation is growing into and clogging inlets and outlets	Keep inlets and outlets clear. Move vegetation if problem persists.
Vegetation is growing poorly, not flowering, has spotted or yellowing leaves, or has weak stems or roots.	<ul style="list-style-type: none"> <li>» Test soil to identify specific nutrient problems (excess or deficiencies).</li> <li>» Consult with a professional knowledgeable in natural, slow-release amendments or refer to natural lawn and garden care resources.</li> <li>» Do not use synthetic fertilizers.</li> <li>» Consider selecting different plants for soil conditions.</li> </ul>



The following appendices to the Rain Garden Handbook for Western Washington include reference materials that support the guidance in 1-PLAN, 2-BUILD, 3-PLANT, and 4-MAINTAIN.



# Appendices



Linda Andrews

## APPENDICES

- Appendix A: Plant List
- Appendix B: Other Resources and Websites
- Appendix C: Introduction to Washington State Department of Ecology's Requirements for Rain Gardens in Western Washington

Background Image: Jane Billingham

# Selected Plants for Rain Gardens in Western Washington

The plant list on the following pages includes native and non-native plant species and varieties suitable for rain gardens that are commonly available in Western Washington. This plant list is not intended to be inclusive of all plants appropriate for rain gardens, but a guide to some of the more commonly used rain garden plants in our region at the time of publication. You can explore many plant choices for rain gardens, especially for Zone 3 plantings. The website [www.greatplantpicks.org](http://www.greatplantpicks.org) is a great resource for plants adapted to Western Washington. Refer to the resources list (Appendix B) for some additional reference sources for plants.

Select the right plants to match the soil, soil moisture, sun/shade exposure, and other conditions on your site. The plant list identifies each plant's correlation to the three planting zones characterized by soil moisture:

- **ZONE 1:** Areas of periodic, or frequent standing or flowing water. Zone 1 plants should also tolerate the seasonally dry summers in Western Washington without extra watering (except during the initial 1- to 3-year establishment period).
- **ZONE 2:** Periodically moist or saturated soils during larger storms. Plants are typically planted on side slopes in this zone and can help to protect against erosion once established.
- **ZONE 3:** Drier soils, infrequently subject to inundation or saturation. Plants installed in this zone are typically planted on a berm or just outside the perimeter of the rain garden. This zone can blend with the existing landscape of the site if desired. The plant list includes only some of the many beautiful plants you can explore for Zone 3.


























## OTHER SPECIAL CONSIDERATIONS

**EXPOSURE** - Some plants do better in full sun, partial shade, and/or shade. When planning your garden layout, observe seasonal differences in exposure throughout the day and between summer and winter due to the changing angle of the sun as well as leaf drop of surrounding trees and shrubs.

**DROUGHT TOLERANCE** - Plants included are typically tolerant of dry summer conditions experienced in Western Washington. However, to establish these plants, summer irrigation will be necessary during the first 1 to 3 years after planting and may be necessary during periods of drought in subsequent years.






















**PLANT SPACING AND LARGE TREES** - Consider height, spread, and extent of roots at maturity. Use caution for plant selection in areas near utilities including buried pipes, wires, and other structures. If placed close to a road or driveway, consider the potential for lower limbs to reduce visibility.

1, 2, or 3	Planting Zones
D	Deciduous
E	Evergreen
E* (Semi)	Semi-evergreen; typically evergreen in mild winters
	Native Plant or Cultivar
	Full Sun Exposure
	Partial Sun Exposure
	Shade





	Scientific Name Common Name	ZONE			D or E	NATIVE	EXPOSURE			MATURE SIZE		TIME OF BLOOM	PLANT CHARACTERISTICS
		1	2	3			Sun	Partial	Shade	Height	Width		
<b>EMERGENTS (SEDGES, RUSHES, AND BULRUSHES)</b>													
Peggy Campbell	 <i>Carex comans</i> <b>'Frosted Curls'</b> New Zealand hair sedge	1	2	3	E					12 to 18"	to 18" spreading		Fine-textured, tufted 1/16"- wide, hair-like (almost cylindrical) silvery leaves. Leaves shimmer iridescent in the breeze giving an illusion of falling water.
Erica Guttman	 <i>Carex flacca</i> <b>'Blue Zinger'</b> Blue Sedge		2	3	E					6 to 12"	15 to 18"	Spring	Spreading groundcover to define edges with dwarf tufts of blue-gray evergreen foliage. Tolerates both moisture and drought.
Hoffman Nursery	 <i>Carex laxiculmis</i> <b>'Hobb'</b> Bunny blue sedge		2	3	E					6 to 12"	12 to 16"	Spring	Clump-forming sedge with wide, silvery-blue leaves for year-round color in shady sites. Tolerates moist soils.
King County Native	 <i>Carex obnupta</i> Slough sedge	1	2		E					12 to 36"	to 48" spreading		Aggressive spreader and can become dominant. Pairs well with other aggressive spreaders. Shiny foliage. Excellent for binding soil to prevent erosion.
Erica Guttman	 <i>Carex oshimensis</i> <b>EverColor® cultivars</b> Japanese sedge cultivars	1	2	3	E					12 to 30"	12 to 30"	May	This series features striking color options and is great for shady rain gardens; consider 'Everillo,' 'Everest,' & 'Everlime' cultivars. Best in rain gardens with shallow ponding depth, as these are very dwarf plants.
Peggy Campbell	 <i>Carex oshimensis</i> <b>'Evergold'</b> Variegated Japanese sedge	1	2	3	E					12 to 24"	24 to 36"	Late spring or early summer	Deep green variegated creamy white band on foliage that turns to yellow. Great accent plant. Good for edges and borders.
Snohomish County	 <i>Carex testacea</i> Orange New Zealand sedge	1	2	3	E					12 to 15"	to 15" spreading	Early summer	Tried and true. Mounding clump form. Orange-brown/bronze color in spring and summer. More intensive orange in winter.

























Scientific Name Common Name	ZONE			D or E	NATIVE	EXPOSURE			MATURE SIZE		TIME OF BLOOM	PLANT CHARACTERISTICS
	1	2	3			Sun	Partial	Shade	Height	Width		

**EMERGENTS (SEDGES, RUSHES, AND BULRUSHES)**



















 <p>Name That Plant</p>	<i>Juncus acuminatus</i> Tapertip rush	1			D					6 to 18"	12 to 24" spreading	Spring to summer	Slow-growing rush with purple to reddish brown flowers in an open array of clusters.
 <p>King County Native</p>	<i>Juncus ensifolius</i> Dagger-leaf rush	1			D					6 to 15"	6 to 9" spreading	Summer	Flattened stems like an iris. Dark brown flowers small and rounded like pom-poms. Yellow-orange fall color. Spreads only lightly.
 <p>calluther.on.edu</p>	<i>Juncus patens</i> 'Elk Blue' Elk blue rush	1	2		E					12 to 24"	18 to 24" spreading	May to August	Spiky, blue-green grass-like foliage. Clump forming. Use 'Elk Blue' and avoid straight species which is aggressive and overly tall.
 <p>Wikipedia Commons</p>	<i>Juncus tenuis</i> Path rush	1	2		E					6 to 20"	6 to 30"	May to September	Soft, bright green foliage and delicate flowers. Spreads only lightly.
 <p>King County Native</p>	<i>Scirpus microcarpus</i> Small-fruited bulrush	1			E					24 to 36"	12 to 24" spreading	June to August	Aggressive spreader, can become dominant. Pairs well with other aggressive spreaders. Large, round flower clusters persist over winter. Attractive in combination with spiky flowers. Excellent for binding soil to prevent erosion.

**GROUNDCOVERS, ORNAMENTALS, GRASSES, HERBACEOUS PERENNIALS, AND FERNS**























 <p>Peggy Campbell</p>	<i>Achillea</i> Yarrow			3	D					24 to 36"	24 to 36"	June to August	Attracts insects and butterflies. Aromatic leaves. Many varieties including 'Moonshine,' 'Paprika,' and 'Terracotta'. Flower stalks remain over winter providing forage for wildlife.
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	Scientific Name Common Name	ZONE			D or E	NATIVE	EXPOSURE			MATURE SIZE		TIME OF BLOOM	PLANT CHARACTERISTICS
		1	2	3			Sun	Partial	Shade	Height	Width		
Missouri Botanical Garden	 <i>Acorus calamus</i> <b>'Variegatus'</b> Variegated sweet flag		2	3	E* (semi)					24"	18 to 24"		Fragrant. Sword-shaped leaves. May require more water to get established.
Gardens and Plants	 <i>Acorus gramineus</i> <b>'Ogon'</b> Golden variegated sweet flag	1	2		E* (semi)					10"	4 to 6"	Spring	Grows in clumps. Semi-evergreen. Brighter in sun. Deer resistant. Fragrant flowers. May require more water to get established.
Native Plant Trust	 <i>Ajuga</i> Carpet bugle		2	3	D					6"	12 to 24"	Spring to early summer	Variety of leaf colors with most having purple flowers. Spreads by runners.
Peggy Campbell	 <i>Aquilegia formosa</i> Western columbine		2	3	D					12 to 36"	12 to 36"	Spring	Beautiful red and yellow flowers. Attracts hummingbirds and butterflies. Tolerant of seasonal flooding.
Snohomish County	 <i>Arctostaphylos uva-ursi</i> Bearberry or Kinnikinnick		2	3	E					6 to 12"	24 to 36" spreading	March to June	Low, slow-growing ground cover. Easy-care once established. Prune back as needed. Pink buds open to small, bell-shaped white flowers. Red berries.
Wikipedia Commons	 <i>Aster</i> Garden aster		2	3	D					12 to 42"	36"	July to August	Select variety for preferred height, bloom time and flower. Thrives in full sun.
King County Native	 <i>Struthiopteris</i> <b>(Blechnum) spicant</b> Deer fern		2	3	E					12 to 36"	24"	April to May	Long, narrow, dark glossy leaves with wavy, crinkled edges. Requires organic matter soil and replenishment of woodchip mulch. Tolerant of shallow flooding. Avoid sun exposure.

## GROUNDCOVERS, ORNAMENTALS, GRASSES, HERBACEOUS PERENNIALS, AND FERNS (CONTINUED)

	Scientific Name Common Name	ZONE			D or E	NATIVE	EXPOSURE			MATURE SIZE		TIME OF BLOOM	PLANT CHARACTERISTICS
		1	2	3			Sun	Partial	Shade	Height	Width		
King County Native	<i>Camassia leichtlinii</i> Large or giant camas		2	3	D					36 to 48"	18"	Late spring to early summer	Loose clusters of flowers ranging from light to deep blue. Particularly showy planted in groups.
King County Native	<i>Camassia quamash</i> Common camas		2	3	D					18"	12"	May to June	Loose clusters of deep blue flowers. Particularly showy planted in groups.
Wikipedia Commons	<i>Coreopsis verticillata</i> or <i>C. lanceolata</i> Tickseed		2	3	D					18 to 36"	12 to 18"	Summer to fall	Smooth stems and leaves. Flowers of yellow, orange, maroon, and bronze. Thrives in full sun. Try 'Moonbeam,' 'Zagreb,' or 'Full Moon.'
Flickr   Patrick Standish	<i>Delosperma</i> Ice plant (hardy cultivars)		2	3	E					24 to 36"	12 to 24"	Spring to early summer	Low spreading succulent-like ground cover with colorful daisy-like flowers.
Snohomish County	<i>Deschampsia cespitosa</i> 'Northern Lights' Tufted hair grass	1	2	3	E* (semi)					6 to 12"	6 to 12"	Late spring to early summer	Stunning, grassy foliage with creamy white variegation that turns pink in winter (attractive in winter months). Several other cultivars available.
Hopes Groves Nurseries	<i>Deschampsia cespitosa</i> 'Pixie Fountain' Pixie fountain tufted hair grass	1	2	3	E					18 to 24"	18"	July, August	A dwarf cultivar that stays tidier than the PNW native species. Features compact deep-green foliage and bright gold, silver, and purple-hued flowers rise above foliage & wave in the wind. Seedheads add winter beauty.
Washington Native Plant	<i>Dicentra formosa</i> Pacific bleeding heart		2	3	D					8 to 12"	24"	Spring	Seasonal splash of delicate foliage and attractive pink to red flowers. May need watering in sun. Also consider <i>Dicentra septabilis</i> , a popular non-native bleeding heart, and its cultivars.

GROUNDCOVERS, ORNAMENTALS, GRASSES, HERBACEOUS PERENNIALS, AND FERNS (CONTINUED)

	Scientific Name Common Name	ZONE			D or E	NATIVE	EXPOSURE			MATURE SIZE		TIME OF BLOOM	PLANT CHARACTERISTICS
		1	2	3			Sun	Partial	Shade	Height	Width		
GROUNDCOVERS, ORNAMENTALS, GRASSES, HERBACEOUS PERENNIALS, AND FERNS (CONTINUED)													
Wikipedia Commons	 <i>Echinacea purpurea</i> Purple coneflower			3	D					36 to 48"	24"	Mid-summer to late fall	Flowering may continue until frost. Fowers have rosy-purple hue with a large orange cone in the center. Many cultivars available with various flower colors. Thrives in full sun.
Peggy Campbell	 <i>Echinops</i> Globe thistle			3	D					24 to 48"	18 to 24"	Mid-summer to late fall	Wide, coarse, prickly, grayish-green leaves. Spherical, blue-purple, golf-ball sized flowers. Great plant for butterflies and pollinators. Several species.
PNW Flowers	 <i>Erigeron speciosus</i> Showy fleabane		2	3	D					18"	24"	Spring to summer	Leafy stems. Produces clusters of dark violet/lavender flowers with bright yellow eye. Various cultivars available.
Wikipedia Commons	 <i>Erysimum</i> Wallflower		2	3	E* (semi)					6 to 24"	12 to 24"	Spring to fall	Evergreen sub-shrubs varying in height, fragrance, and flower color. Many cultivars, such as 'Apricot Twist,' 'Fragrant Sunshine,' 'John Codrington,' and 'Wenlock Beauty.'
WSU PNW Plants	 <i>Festuca glauca</i> 'Beyond Blue' Blue fescue			3	E* (semi)					up to 12"	up to 12"	Summer	Striking blue gray to silvery white clumping grass. Good as edging.
King County Native	 <i>Fragaria chiloensis</i> Beach or Coastal strawberry		2	3	E					6 to 10"	36" spreading	Summer	Aggressive spreader. Shiny, evergreen foliage with large white flowers and small hairy strawberries. Great groundcover for weed control.
Wikipedia Commons	 <i>Galium odoratum</i> Sweet woodruff		2	3	E					8"	12"	Spring to summer	Quick spreading, mat-forming groundcover for shady areas. Features clusters of tiny white flowers atop delicate foliage. Can overwhelm less aggressive plants.











	Scientific Name Common Name	ZONE			D or E	NATIVE	EXPOSURE			MATURE SIZE		TIME OF BLOOM	PLANT CHARACTERISTICS
		1	2	3			Sun	Partial	Shade	Height	Width		
American Meadows	<i>Gaura lindheimeri</i> <i>Gaura</i> or <i>Wandflower</i>		2	3	D					30 to 36"	30 to 36"	May to August	<i>Airy clusters of small, attractive pink flowers. Many cultivars available including 'Siskiyou Pink,' 'Whirling Butterflies,' and 'Passionate Rainbow.'</i>
Peggy Campbell	<i>Geranium cantabrigiense</i> <i>'Biokovo'</i> <i>Biokovo hardy geranium</i>		2	3	E* (semi)					6 to 8"	6 to 8"	Early spring to summer	<i>Pleasantly scented foliage. Pinkish white blooms.</i>
US Forest Service	<i>Geum</i> <i>Avens</i>		2	3	D					8 to 20"	12"	Spring to summer (long blooming)	<i>Flowers of red, apricot, orange, and yellow. Many are evergreen or semi-evergreen. Many cultivars such as 'Mango Lassi,' 'Starker's Magnificum,' 'Borisil,' and 'Mrs. Bradshaw.'</i>
Wikipedia Commons	<i>Helianthemum nummularium</i> <i>Sunrose</i>			3	E					6 to 24"	36"	May to July	<i>Low-growing evergreen subshrub that's great for berms and front of borders. Many varieties available for flower color variation, including: salmon, pink, red, yellow, white, and golden color.</i>
Wikipedia Commons	<i>Hemerocallis</i> <i>Daylily</i>		2	3	D					24 to 48"	24"	Spring to summer (long blooming)	<i>Some varieties are fragrant and repeat bloomers. Clusters of flowers attract butterflies. Many colors to choose from, including: pinks, reds, yellows, oranges, lavender, and white.</i>
Wikipedia Commons	<i>Hesperantha coccinea</i> <i>Crimson flag</i>	1	2	3	E* (semi)					18 to 24"	18 to 24"	Spring and late summer (repeat bloom sequence)	<i>Showy red or coral flowers in gladiolus-type arrangement. Cump-forming habit with sword-like foliage. Some cultivars are evergreen.</i>
Peggy Campbell	<i>Heuchera</i> <i>Coral bells</i> or <i>Alumroot</i>		2	3	D					24 to 36"	12 to 18"	Late spring or early summer	<i>Highly variable depending on cultivar selected. Foliage from chartreuse to black. Flowers white to scarlet. Some are more sun tolerant than others, try 'Purple Palace,' or 'Obsidian.'</i>

GROUNDCOVERS, ORNAMENTALS, GRASSES, HERBACEOUS PERENNIALS, AND FERNS (CONTINUED)



















	Scientific Name Common Name	ZONE			D or E	NATIVE	EXPOSURE			MATURE SIZE		TIME OF BLOOM	PLANT CHARACTERISTICS
		1	2	3			Sun	Partial	Shade	Height	Width		
Wikipedia	<i>Hyssopus officinalis</i> 'Rosea' or 'Nana' <i>Hyssop cultivars</i> (pink or blue)		2	3	E					18 to 24"	18 to 24"	Summer to fall	Evergreen subshrub with pungent foliage. Dark blue flower spikes. Attracts butterflies and bees. Deer-resistant.
Snohomish County	<i>Iris douglasiana</i> Douglas iris	1	2	3	E					12 to 24"	18 to 24"	Early spring	Purple and blue flowers. Narrow foliage in clumps similar to course grass. Do not use non-native and invasive yellow-flag iris.
Pacific Bulb Society	<i>Iris tenax</i> Oregon or Tough-leaf iris	1	2	3	E* (semi)					12 to 18"	12"	May to June	Attractive and showy blue flowers. Do not use non-native and invasive yellow-flag iris.
Peggy Campbell	<i>Lavandula angustifolia</i> English lavender			3	E					24"	24 to 60"	June to August	Blue to purple flowers that, along with leaves, are aromatic. Attracts insects. Great for edges. Many cultivars are available.
Jean-Pol Grandmont	<i>Lavandula stoechas</i> Spanish lavender			3	E					36"	24"	May to July	Gray-green leaves. Dark purple flowers with bracts above like bunny ears. Highly attractive to butterflies and honey bees. Many cultivars are available.
Most Beautiful Flower	<i>Liatris spicata</i> Gayfeather or Blazing star		2	3	D					24 to 48"	6 to 18"	Mid to late summer	Spiky purple-to-pink flowers. Handles broad range of soils from clay to sand. Nice complement to ornamental grasses and daylilies.
US Forest Service	<i>Lupinus</i> Lupine			3	D					18 to 48"	24 to 30"	Summer	Clusters of blue, purple, or reddish flowers on spikes. Important for butterflies and butterfly caterpillars. Many species and cultivars are available.




















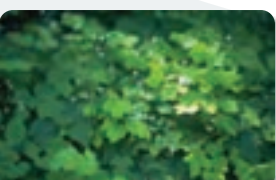



GROUNDCOVERS, ORNAMENTALS, GRASSES, HERBACEOUS PERENNIALS, AND FERNS (CONTINUED)








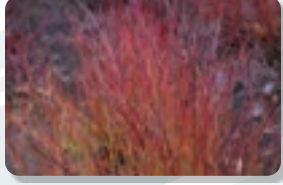


















	Scientific Name Common Name	ZONE			D or E	NATIVE	EXPOSURE			MATURE SIZE		TIME OF BLOOM	PLANT CHARACTERISTICS
		1	2	3			Sun	Partial	Shade	Height	Width		
The Greenhouse PNW	<i>Miscanthus sinensis</i> 'Little Kitten,' 'Little Miss,' & other dwarf cultivars Dwarf maidengrass cultivars			3	D					15 to 36"	15 to 36"	August to October	Dwarf, clump-forming grass features plumes of whisk-like flowers, becoming creamy-beige seed clusters in fall and persisting through winter to support wildlife.
Hoo House Nursery	<i>Molinia caerulea</i> 'Moorhexe' Moorhexe moor grass		2	3	D					24 to 36"	12 to 24"	July to October	Compact, narrow tuft-forming grass with very upright dark green foliage that turns golden/orange in fall. Narrow purplish flowers persist as seeds over winter. Very adaptable to many sites.
Missouri Botanical	<i>Molinia caerulea</i> 'Variegata' Variegated moor grass	1	2		D					12 to 18"	12 to 18"	July	This cultivar has creamy yellow and white striped foliage. Many others available. Provides an attractive edge.
Wikipedia Commons	<i>Nepeta x faassenii</i> Catmint			3	D					12"	18 to 24"	Late spring to early summer	Heart-shaped and gray-green leaves. Lavender-blue flowers. Attractive to cats. Thrives in full sun. Many cultivars with differing heights, spread, and flower color.
Wikipedia Commons	<i>Ophiopogon planiscapus</i> Black mondo grass			3	E* (semi)					Up to 12"	up to 12"	Late spring to early summer	Striking black grass-like foliage is a nice background for brightly colored flowers. Spreads slowly. Bell-shaped white or purple flowers. Best in filtered light. Try 'Nigrescens' or 'Ebony Knight.'
Wikipedia Commons	<i>Panicum virgatum</i> Switch grass		2	3	D					48 to 72"	48 to 72"	Summer	Clump-forming grass with showy, airy flowers. Foliage ranges from bright red to bluish. Great fall color and winter interest. Try 'Heavy Metal,' 'Dallas Blues,' or 'Shenandoah.'
North Creek Nursery	<i>Pennisetum (Cenchrus) alopecuroides</i> (named cultivars) Fountain grass cultivars			3	D					4 to 48"	12 to 24"	Summer, some over winter	Bottle-brush-like flowers persist through winter. Trim back old foliage in Feb/March. Seek sterile cultivars of different sizes, such as 'Burgundy Bunny,' 'Hameln,' or 'Lumen Gold.'

GROUNDCOVERS, ORNAMENTALS, GRASSES, HERBACEOUS PERENNIALS, AND FERNS (CONTINUED)

	Scientific Name Common Name	ZONE			D or E	NATIVE	EXPOSURE			MATURE SIZE		TIME OF BLOOM	PLANT CHARACTERISTICS
		1	2	3			Sun	Partial	Shade	Height	Width		
PNW Flowers	<i>Penstemon cardwellii</i> <i>and Penstemon serrulatus</i> Beard tongue			3	E* (semi)					12 to 30"	12 to 24"	Early summer	Bright purple to blue purple flowers. Found in west side forests and on rocky slopes. Other natives available including other evergreens.
Wikipedia Commons	<i>Perovskia atriplicifolia</i> Russian sage			3	E* (semi)					36 to 48"	36 to 48"	Late spring to late summer	Semi-woody. Aromatic gray-green foliage. Small lavender-blue flowers. Very adaptable.
NW Plants	<i>Polystichum munitum</i> Western sword fern		2 3		E					36 to 48"	36 to 60"		Large native fern. Stately appearance. Prefers some shade.
Wikipedia Commons	<i>Rubus calycioides</i> Creeping raspberry		2 3		E					4 to 8"	36 to 60" can spread rapidly	Spring	Aggressive spreader. White flowers producing orange berries. Turns raspberry red with the onset of autumn. Requires more regular water to become established.
Wikipedia Commons	<i>Rudbeckia hirta</i> Black-eyed Susan			3	D					12 to 36"	12 to 36"	June to October	Orange-yellow flowers with dark brownish-black centers. Attractive to bees.
King County Native	<i>Sidalcea hendersonii</i> Henderson's checker-mallow	1			D					36 to 48"	24 to 36"	Summer	Spiky pink flower clusters atop long stems are nice complement to tall bulrushes. Can spread aggressively to quickly fill in Zone 1 with emergents.
US Forest Service	<i>Symphotrichum chilense</i> Pacific aster		2 3		D					18 to 36"	36"	June to September	White to purple flowers. Thrives in full sun.




















GROUNDCOVERS, ORNAMENTALS, GRASSES, HERBACEOUS PERENNIALS, AND FERNS (CONTINUED)








	Scientific Name Common Name	ZONE			D or E	NATIVE	EXPOSURE			MATURE SIZE		TIME OF BLOOM	PLANT CHARACTERISTICS
		1	2	3			Sun	Partial	Shade	Height	Width		
<b>GROUNDCOVERS, ORNAMENTALS, GRASSES, HERBACEOUS PERENNIALS, AND FERNS (CONTINUED)</b>													
Flickr	 <b><i>Symphyotrichum subspicatum</i></b> Douglas aster	1			D					6 to 36"	36" spreading	June to September (late season bloomer)	Aggressive spreader (can become dominant plant). Pairs well with other aggressive spreaders. Blue to purple flowers with yellow centers. Prefers full sun, but tolerates some shade.
King County Native	 <b><i>Tellima grandiflora</i></b> Fringecup		2	3	D					12"	up to 12"	March to June	Yellow-green to pink flowers. Foliage persists somewhat over winter.
King County Native	 <b><i>Tiarella trifoliata</i></b> Foamflower		2	3	D					12"	12"	Early to mid summer	Can form dense colonies. Showy sprays of creamy-white flowers. Foliage persists somewhat over winter.
King County Native	 <b><i>Tolmiea menziesii</i></b> Youth-on-age, Piggyback plant		2	3	D					12 to 24"	12"	April to August	Brownish-purple flowers. Makes effective groundcover in summer. Foliage present in winter when tiny leaves are seen in axils of older leaves.
Washington Native Plant	 <b><i>Trillium ovatum</i></b> Western trillium		2	3	D					Up to 18"	12"	Early spring	Unique, white flowers. Not easily adaptable.
Colleen Miko	 <b><i>Vancouveria hexandra</i></b> Inside-out flower or Duck's foot		2	3	E* (semi)					8 to 12"	12 to 36"	Spring	Groundcover blends with other natives. Unique flowers. Foliage is somewhat persistent over winter.

	Scientific Name Common Name	ZONE			D or E	NATIVE	EXPOSURE			MATURE SIZE		TIME OF BLOOM	PLANT CHARACTERISTICS
		1	2	3			Sun	Partial	Shade	Height	Width		
<b>SMALL TO MEDIUM SHRUBS</b>													
Erica Guttmann	 <i>Aronia melanocarpa</i> <b>Low Scape Mound®</b> Low scape mound® chokeberry	1	2	3	D					2 ft.	3 to 4 ft.	April-June	Compact, rounded form grows in all settings but the deepest shade. Covered with dainty, white flowers in spring, followed by blue-black fruits that attract birds.
UW Botanical Garden	 <i>Cornus sericea</i> <b>'Flaviramea'</b> Yellow-twig dogwood	1	2	3	D					6 to 8 ft.	5 ft. spreading	May to June	Small white flowers. Reddish-purple fall color. Yellow stems provide color in winter. Adaptable to various soil conditions. Prune hard periodically to retain size and stem color,
Oregon State	 <i>Cornus sericea</i> <b>'Kelsey'</b> Dwarf red-twig dogwood	1	2	3	D					1.5 to 3 ft.	3 ft. spreading	May to June	Small white flowers. Berry-like fruit. Compact form. Striking winter color with red stems.
King County Native	 <i>Gaultheria shallon</i> Salal		2	3	E					2 to 5 ft.	5 ft. spreading	March to June	White or pinkish flowers. Reddish-blue to dark purple berries. Spreads well in shade.
Colleen Miko	 <i>Hydrangea quercifolia</i> Oakleaf hydrangea			3	D					3 to 8 ft.	4 to 6 ft.	Summer to fall	The only drought-tolerant hydrangea. Features unusual oak-like leaves and long white flower clusters. Several cultivars offer dwarf to taller shrubs and single to double flowers.
White Flower Farm	 <i>Itea virginica</i> <b>Little Henry®</b> or <b>'Merlot'</b> Dwarf sweetspire		2	3	D					2 to 3 ft.	2 to 4 ft.	June to July	Long, white cylindrical flower clusters. In fall, outer leaves turn purple-red, while inner leaves turn yellow-orange. Tolerates deep shade, but best flowers, foliage, and form in partial to full sun.
Wikipedia Commons	 <i>Lonicera pileata</i> Boxwood honeysuckle		2	3	E					3 ft.	5 ft.	April to June	Best suited for very large rain gardens. Widely spreading, low-growing shrub. Glossy evergreen leaves. Great for covering berms and side slopes.

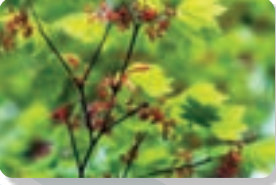



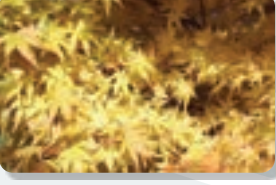






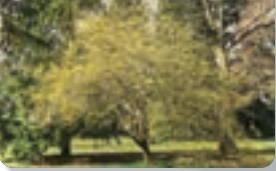


	Scientific Name Common Name	ZONE			D or E	NATIVE	EXPOSURE			MATURE SIZE		TIME OF BLOOM	PLANT CHARACTERISTICS
		1	2	3			Sun	Partial	Shade	Height	Width		
Flickr   Maia Dumrat	<i>Lonicera pileata</i> <b>'Little Lemon Zest'</b> Dwarf boxwood honeysuckle		2	3	E					1 to 2 ft.	2 to 3 ft.	April to June	Dwarf, tidy, compact evergreen shrub featuring green foliage with cream-colored or pale lemon-yellow margins. Pale-yellow honeysuckle flowers are partially hidden, but the sweet fragrance reveals their presence.
Wikipedia Commons	<i>Mahonia aquifolium</i> Tall Oregon-grape		2	3	E					6 to 10 ft.	5 ft. spreading	March to April	Glossy leaves. Yellow flowers. Attracts hummingbirds. Blue-black berries. Can exceed 10 ft. in height.
WSU PNW Plants	<i>Mahonia aquifolium</i> <b>'Compacta'</b> Compact or Dwarf tall Oregon grape		2	3	E					2 to 3 ft.	3 to 4 ft. spreading	April to June	Dwarf form of sun-loving native Oregon grape has same flowers. Stays compact.
King County Native	<i>Mahonia nervosa</i> Low Oregon grape		2	3	E					2 to 3 ft.	2 ft. spreading	April to June	Glossy leaves. Yellow flowers. Blue berries. Attracts hummingbirds.
Wikipedia Commons	<i>Mahonia repens</i> Creeping mahonia		2	3	E					3 ft.	3 ft. spreading	April to June	This creeping Oregon grape from Eastern Washington performs best with some sun and shade during the day. Tidy, compact form.
Snohomish County	<i>Myrica gale</i> Sweet gale	1			D					4 to 8 ft.	4 to 6 ft.	May to June	Fragrant flowers. May need extra water to get established. Tolerant of shallow flooding. Requires regular watering in well-draining soils.
Peggy Campbell	<i>Philadelphus lewisii</i> Mock orange		2	3	D					5 to 10 ft.	5 to 10 ft.	June to July	Fragrant white flowers. Makes thickets.

SMALL TO MEDIUM SHRUBS (CONTINUED)


























	Scientific Name Common Name	ZONE			D or E	NATIVE	EXPOSURE			MATURE SIZE		TIME OF BLOOM	PLANT CHARACTERISTICS
		1	2	3			Sun	Partial	Shade	Height	Width		
<b>SMALL TO MEDIUM SHRUBS (CONTINUED)</b>													
Washington Native Plant	 <b><i>Ribes sanguineum</i></b> Red-flowering currant		2	3	D					6 to 12 ft.	4 to 10 ft.	March to May	Large clusters of rosy-red flowers attract hummingbirds and other pollinators. Dark blue to black berries. Vase-shaped form. Thornless.
Wikipedia Commons	 <b><i>Spiraea lucida</i></b> Shiny-leaf Spirea	1	2	3	D					2 to 3 ft.	3 ft. spreading	May to July	Compact, rounded form is well suited to small-medium sized rain gardens. Shiny-leaf Spirea features bright white flowers and colorful fall foliage.
Dancing Oaks	 <b><i>Sambucus nigra</i></b> Black Lace® Black Lace® elderberry	1	2	3	D					6 to 8 ft.	6 to 8 ft.		A dramatic accent plant with rosy flowers contrasting with blackish, deeply dissected foliage. Blackish-red berries attract wildlife. Prune if necessary after blooming.
King County Native	 <b><i>Spiraea splendens (densiflora)</i></b> Meadow sweet	1	2	3	D					3 to 4 ft.	2 to 4 ft.	March to June	Showy pink flower clusters on orangish twigs make this a nice compact shrub for Zone 1.
Wikipedia Commons	 <b><i>Spiraea thunbergii and Spiraea japonica</i></b> Thunberg spirea and Japanese spirea		2	3						1.5 to 5 ft.	1.5 to 5 ft.	April to July	Cultivars with different height, flower color, and foliage. Some have golden or orange new growth. Try 'Ogon,' 'Magic Carpet,' 'Dakota Goldcharm®,' 'Little Princess,' and 'Neon Flash.'
Wikipedia Commons	 <b><i>Symphoricarpos albus</i></b> Snowberry		2	3	D					2 to 6 ft.	6 ft. spreading	April to June	Aggressive spreader can become dominant plant. White berries from summer to winter. Clusters of pink flowers great for pollinators.
Wikipedia Commons	 <b><i>Symphoricarpos x doorenbosii</i></b> 'Magic Berry' Coralberry		2	3	D					4 to 6 ft.	4 to 6 ft.	April to June	Aggressive spreader can become dominant plant. Magenta berries cover this upright coralberry and add winter interest.









	Scientific Name Common Name	ZONE			D or E	NATIVE	EXPOSURE			MATURE SIZE		TIME OF BLOOM	PLANT CHARACTERISTICS
		1	2	3			Sun	Partial	Shade	Height	Width		
<b>SMALL TO MEDIUM SHRUBS (CONTINUED)</b>													
King County Native	 <i>Vaccinium ovatum</i> Evergreen huckleberry			3	E				4 to 10 ft.	6 ft.	March to June	For partly or very shady spots. This native evergreen provides flowers, beautiful foliage and wildlife habitat. Smaller cultivars include 'Scarlet Ovation' and variegated 'Cascade Sunburst.'	
Wikipedia Commons	 <i>Viburnum opulus</i> 'Nanum' Dwarf cranberry bush		2	3	D				2 to 3 ft.	3 ft. spreading	Late spring	White flowers. Dense mounding habit. Compact with tri-lobed leaves. Deer resistant. Handsome filler plant. Readily re-seeds requiring extra maintenance to control. Many other shrubs available.	

**LARGE SHRUBS AND SMALL TREES**

King County Native	 <i>Acer circinatum</i> Vine maple		2	3	D				15 to 20 ft.	15 to 20 ft.	Early spring	Small, multi-stemmed tree. Brilliant red-orange fall color. Excellent for binding soil to reduce erosion.
WSU PNW Flowers	 <i>Acer palmatum</i> 'Sango Kaku' Coralbark Japanese maple			3	D				20 to 25 ft.	18 to 20 ft.		Coral-red bark. Attractive form for garden.
King County Native	 <i>Amelanchier alnifolia</i> Western serviceberry		2	3	D				8 to 20 ft.	5 to 10 ft.	April to May	Large white flower clusters. Purple to blue-black berries. Attracts native birds.
Wikipedia Commons	 <i>Cornus mas</i> Cornelian cherry			3	D				20 ft.	20 ft.	March to April	Adaptable. Yellow flowers and red fruit.



	Scientific Name Common Name	ZONE			D or E	NATIVE	EXPOSURE			MATURE SIZE		TIME OF BLOOM	PLANT CHARACTERISTICS
		1	2	3			Sun	Partial	Shade	Height	Width		
<b>LARGE SHRUBS AND SMALL TREES (CONTINUED)</b>													
Wikipedia Commons	 <b><i>Crataegus x lavallei</i></b> Lavalle hawthorn			3	D					15 to 30 ft.	15 to 30 ft.	May to June	Small white flowers. Small orange-red fruits.
King County Native	 <b><i>Frangula purshiana</i></b> Cascara		2	3	D					15 to 30 ft.	5 to 10 ft.	April to May	Narrow form fits in smaller spaces. Purple to blue-black berries. Glossy foliage turns orange to yellow in fall.
King County Native	 <b><i>Holodiscus discolor</i></b> Oceanspray			3	D					8 to 15 ft.	6 to 15 ft.	June to July	Creamy-white flower clusters persist as brown seeds over winter. Great for native butterflies and birds. Good soil binder (reduces erosion). If needed, periodically prune hard to maintain size.
Peggy Campbell	 <b><i>Lonicera involucrata</i></b> Twinberry	1	2	3	D					6 to 9 ft.	8 to 10 ft.	Summer/June	Best for very large rain gardens due to wide spreading habit. Can be pruned to look tidy. Yellow flowers with bright red bracts. Shiny berries. Attracts hummingbirds.
Wikipedia Commons	 <b><i>Magnolia virginiana</i></b> <b>Moonglow®</b> Sweet bay or Swamp magnolia	1			E* (semi)					35 to 40 ft.	15 to 18 ft.	Late spring to early summer	Best for large rain gardens. Creamy white flowers. Needs acidic soils. This cultivar is hardier, more upright. May require some summer irrigation after established.
Wikipedia Commons	 <b><i>Malus transitoria</i></b> (dwarf disease-resistant cultivars) Crabapple cultivars			3	D					20 ft.	15 ft.	Spring	Many sizes and flower colors available in disease-resistant cultivars recommended for Pacific Northwest landscapes.
Flickr ] wild trees	 <b><i>Oemleria cerasiformis</i></b> Osoberry		2	3	D					5 to 16 ft.	5 to 12 ft.	February to April	One of the first natives to bloom in early spring. Peach-like flowers in spring turning to plum-like berries in summer. Spreads via underground stems.

	Scientific Name Common Name	ZONE			D or E	NATIVE	EXPOSURE			MATURE SIZE		TIME OF BLOOM	PLANT CHARACTERISTICS
		1	2	3			Sun	Partial	Shade	Height	Width		
<b>LARGE SHRUBS AND SMALL TREES (CONTINUED)</b>													
Guy Meacham	 <i>Parrotia persica</i> <b>'Vanessa'</b> Persian ironwood			3	D					30 ft.	10 to 20 ft.	Late winter to early spring	<i>Multi-stemmed, colorful tree particularly in fall. This cultivar is dense and narrowly upright. Tiny flowers with red stamens.</i>
Washington Native Plant	 <i>Physocarpus capitatus</i> Pacific ninebark	1	2	3	D					8 to 15 ft.	6 to 15 ft.	May to June	<i>Best for large rain gardens (can be thinned as it grows). Best in part shade. Beautiful, peeling multi-colored bark. White flowers. See also P. opulifolius and cultivars in the "small to medium" shrub list.</i>



# Other Resources and Websites

## WESTERN WASHINGTON REGIONAL RAIN GARDEN RESOURCES

- » Washington State University Extension Rain Gardens Website: [raingarden.wsu.edu/](http://raingarden.wsu.edu/)
- » Washington State University County Extension Assistance for Rain Gardens: [extension.wsu.edu/raingarden/rain-gardens-in-your-county/](http://extension.wsu.edu/raingarden/rain-gardens-in-your-county/)
- » 12,000 Rain Gardens in Puget Sound: [www.12000raingardens.org/](http://www.12000raingardens.org/)
- » Building a Raingarden video: [www.youtube.com/watch?v=9Kti4HJ45BM](http://www.youtube.com/watch?v=9Kti4HJ45BM)

## WESTERN WASHINGTON LOCAL JURISDICTION RAIN GARDEN RESOURCES

- » Pierce County Rain Gardens Webpage: [www.piercecountywa.gov/DocumentCenter/View/3529/rain-gardens-how-to-guide?bidId=](http://www.piercecountywa.gov/DocumentCenter/View/3529/rain-gardens-how-to-guide?bidId=)
- » City of Olympia Rain Gardens Webpage: [www.olympiawa.gov/services/water\\_resources/storm\\_\\_\\_surface\\_water/pollution\\_prevention/rain\\_gardens.php](http://www.olympiawa.gov/services/water_resources/storm___surface_water/pollution_prevention/rain_gardens.php)
- » City of Tacoma Rain Gardens Webpage: [www.cityoftacoma.org/cms/One.aspx?portalId=169&pageId=7123](http://www.cityoftacoma.org/cms/One.aspx?portalId=169&pageId=7123)
- » Kitsap County Rain Gardens Webpage: [spf.kitsapgov.com/pw/Documents/7200\\_Rain\\_Garden\\_Guide.pdf](http://spf.kitsapgov.com/pw/Documents/7200_Rain_Garden_Guide.pdf)
- » Snohomish County RainScaping Webpage: [www.RainScaping.info](http://www.RainScaping.info)
- » Seattle Public Utilities RainWise Program: [700milliongallons.org/rainwise/](http://700milliongallons.org/rainwise/)
- » City of Bellingham: [cob.org/services/environment/stormwater/dig-raingarden-project](http://cob.org/services/environment/stormwater/dig-raingarden-project)
- » City of Lynnwood: [www.lynnwoodwa.gov/Government/Departments/Public-Works/Environmental-and-Surface-Water-Management/Rain-Gardens](http://www.lynnwoodwa.gov/Government/Departments/Public-Works/Environmental-and-Surface-Water-Management/Rain-Gardens)

## WESTERN WASHINGTON CONSERVATION DISTRICTS

- » Snohomish Conservation District: [snohomishcd.org/rain-gardens](http://snohomishcd.org/rain-gardens)
- » Pierce Conservation District: [piercedcd.org/244/Rain-Gardens](http://piercedcd.org/244/Rain-Gardens)
- » Whidbey Conservation District: [www.whidbeycd.org/uploads/1/1/6/8/11683986/wicd\\_rain\\_garden\\_service\\_flyer\\_\\_1\\_.pdf](http://www.whidbeycd.org/uploads/1/1/6/8/11683986/wicd_rain_garden_service_flyer__1_.pdf)
- » Kitsap Conservation District: [kitsapcd.org/programs/raingarden-lid](http://kitsapcd.org/programs/raingarden-lid)

## OTHER RELATED RESOURCES

- » Building Healthy Soil and Erosion Control, Washington Organic Recycling Council: [www.buildingsoil.org](http://www.buildingsoil.org)
- » Great Plant Picks—Unbeatable Plants for Your Maritime Northwest Garden: [www.greatplantpicks.org/](http://www.greatplantpicks.org/)
- » Native Plant Salvage Project Websites: [extension.wsu.edu/thurston/nrs/native-plants/](http://extension.wsu.edu/thurston/nrs/native-plants/) and [www.nativeplantsalvage.org/](http://www.nativeplantsalvage.org/)
- » Natural Yard Care (Seattle Public Utilities): [www.seattle.gov/documents/Departments/SPU/EnvironmentConservation/IPM/NaturalYardCare.pdf](http://www.seattle.gov/documents/Departments/SPU/EnvironmentConservation/IPM/NaturalYardCare.pdf)
- » Natural Yard Care Information and Information on Organic Materials Management (Washington State Department of Ecology): [www.ecy.wa.gov/programs/swfa/organics/soil.html](http://www.ecy.wa.gov/programs/swfa/organics/soil.html)
- » Noxious Weed Control: [www.kingcounty.gov/weeds](http://www.kingcounty.gov/weeds)
- » Master Gardeners, Washington State University Extension: [mastergardener.wsu.edu/](http://mastergardener.wsu.edu/)
- » Washington Native Plant Society Website: [www.wnps.org/](http://www.wnps.org/)
- » Puget Sound Partnership Website/Low Impact Development in Puget Sound: [www.psp.wa.gov/](http://www.psp.wa.gov/)
- » Oregon Sea Grant Extension, Oregon State University Rain Garden Handbook: <https://seagrant.oregonstate.edu/sgpubs/oregon-rain-garden-guide>
- » San Francisco Rain Guardians: [sfpuc.org/learning/how-you-can-help/rain-guardians](http://sfpuc.org/learning/how-you-can-help/rain-guardians)
- » Stormwater Contamination in Puget Sound and Rain Gardens video: [www.youtube.com/watch?v=gF0s20RDz7g](http://www.youtube.com/watch?v=gF0s20RDz7g)

# Introduction to Washington State Department of Ecology's Requirements for Rain Gardens in Western Washington

This appendix is divided into three sections:

1. Background - An overview of the Washington State Department of Ecology's requirements including implementation timelines.
2. Six important questions about Rain Gardens and the 2024 Stormwater Management Manual for Western Washington (SWMMWW) Minimum Requirements - How rain gardens may be used to meet Ecology's stormwater requirements.
3. References - A table of references and links to further resources.

***Please note that local jurisdictions may have requirements that vary from Ecology's stormwater requirements. You should talk with your municipal building permits or development services department about your project to find out the exact requirements that apply to your project.***

## Background

The federal Clean Water Act requires cities and counties meeting certain population levels to have a National Pollutant Discharge Elimination System (NPDES) permit for stormwater management. In Washington State, the Washington State Department of Ecology (Ecology) has been delegated the authority to administer the NPDES permits. State law (RCW 90.48.030 and RCW 90.48.162) also authorizes Ecology to control impacts of stormwater discharges to all waters of Washington State, including groundwater, through permits.

Requirements within the permits vary substantially between Western Washington and Eastern Washington. This appendix only discusses requirements associated with Western Washington.

Ecology has issued two Municipal Stormwater General Permits to cities and counties within Western Washington based on population. The Phase I Municipal Stormwater General Permit covers the Cities of Seattle and Tacoma, and Snohomish, Pierce, King, and Clark Counties. The Phase II Western Washington Municipal Stormwater General Permit covers approximately 82 cities and 5 counties in Western Washington and 28 Secondary Permittees including school districts, colleges, and ports. Stormwater General Permits have been in place now for over 20 years. To see if your city or county is covered under a Municipal Stormwater Permit visit [ecology.wa.gov/Regulations-Permits/Permits-certifications/Stormwater-general-permits/Municipal-stormwater-general-permits](https://ecology.wa.gov/Regulations-Permits/Permits-certifications/Stormwater-general-permits/Municipal-stormwater-general-permits)

## HOW DO THE MUNICIPAL STORMWATER PERMITS RELATE TO THE STORMWATER MANAGEMENT MANUAL FOR WESTERN WASHINGTON?

Within the municipal stormwater permits, there are certain requirements associated with controlling stormwater runoff from new development, redevelopment, and construction sites. As part of these requirements, cities and counties are required by their permit to adopt Minimum Requirements that are the same as, or equivalent to, the minimum requirements within Appendix 1 of the Permit and the Stormwater Management Manual for Western Washington (SWMMWW). Local jurisdictions may also choose to have more stringent requirements. You should talk with your municipal building permits or development services department about your project to find out the exact requirements that apply to your project. The SWMMWW can be viewed and downloaded here: [fortress.wa.gov/ecy/ezshare/wq/Permits/Flare/2019SWMMWW/2019SWMMWW.htm](https://fortress.wa.gov/ecy/ezshare/wq/Permits/Flare/2019SWMMWW/2019SWMMWW.htm)

## WHEN ARE THE REQUIREMENTS OF THE SWMMWW (OR MUNICIPAL EQUIVALENT) IMPLEMENTED?

Versions of the SWMMWW, as well as the equivalent for Eastern Washington, have been in place for over 20 years. In 2024, Ecology reissued the latest SWMMWW. Western Washington municipalities have different deadlines for adopting the 2024 SWMMWW or equivalent:

- July 1, 2026 for Phase I cities and counties.
- June 30, 2027 or by their Growth Management Act Comprehensive Plan timeline, whichever is later for Phase II cities and counties.

Cities and Counties may choose to adopt earlier. This appendix focuses on the Washington State Department of Ecology's SWMMWW only. Local jurisdictions may prepare their own guidance. Check with your local city or County to ensure that you are using the proper guidance.

## SIX IMPORTANT QUESTIONS ABOUT RAIN GARDENS AND THE 2024 SWMMWW MINIMUM REQUIREMENTS

These questions provide an introductory guide of where to look for more details.

### 1. *What are the Minimum Requirements in the 2024 SWMMWW?*

Within the 2024 SWMMWW there are nine minimum requirements:

1. Preparation of Stormwater Site Plan
2. Construction Stormwater Pollution Prevention (SWPPP)
3. Source Control of Pollution
4. Preservation of Natural Drainage Systems and Outfalls
5. On-site Stormwater Management
6. Runoff Treatment
7. Flow Control
8. Wetlands Protection
9. Operation and Maintenance

Rain gardens can be used to help satisfy Minimum Requirement #5 through the List Option when only Minimum Requirements #1 through #5 apply.

### 2024 SWMMWW Reference:

- Section I-3 - Minimum Requirements for New Development and Redevelopment

## **2. When do Minimum Requirements #1 through #5 apply?**

Projects are evaluated based on project type, size, and other thresholds to determine which Minimum Requirements apply to the project. Hard surfaces that trigger Minimum Requirements #1 through #5 include any impervious surface, permeable pavement or vegetated roofs. Disturbed areas include when your project converts vegetation to lawn.

If your project is:

- Creating or replacing between 2,000 and 5,000 square feet of hard surfaces (such as building an addition, adding a new driveway)
- OR disturbing between 7,000 square feet and 33,000 square feet (¾ acre) of vegetation

Then most likely, Minimum Requirements #1 through #5 will apply to your project. Rain gardens are not appropriate for larger projects that are required to meet Minimum Requirements #1 through #9.

Examples of projects that would trigger Minimum Requirements #1 through #5 include:

- A new 2,000 square foot roof.
- A 1,000 square foot asphalt driveway that is replaced (not just overlaid or resealed). This example assumes that existing asphalt is removed to the underlying gravel and 1,000 square feet of asphalt is added to widen the driveway and increase parking.
- A new 2,000 square foot gravel driveway.
- 7,000 square feet lot is cleared and replaced with a 1,000 square foot building, 500 square feet of asphalt and 5,500 square feet of lawn.

### **2024 SWMMWW References:**

- Section I-3.3–Applicability of the Minimum Requirements
- Section I-3.4–Minimum Requirements, Minimum Requirements #1 through #5

## **3. How do rain gardens fit into Minimum Requirement #5?**

In the 2024 SWMMWW, rain gardens are considered as an On-site Stormwater Management Best Management Practice. On-site Stormwater Management BMPs are a synonym for Low Impact Development (LID) BMPs. It is important to note that rain gardens are not considered as a “Stormwater Treatment and Flow Control BMP/Facility” (used to satisfy Minimum Requirements #6 and #7).

Minimum Requirement #5: On-site Stormwater Management, requires the use of On-site Stormwater Management Best Management Practices (BMPs) to infiltrate, disperse, and retain stormwater runoff on-site to the extent feasible without causing flooding or erosion impacts. This requirement may be met either by using a prescribed list approach, or by meeting the LID Performance Standard. Both of these approaches are explained in detail in 2024 SWMMWW Section I-3.4.5 - MR5: On-site Stormwater Management.

Rain gardens are part of List #1, the prescribed list of BMPs in the SWMMWW, which can be used to meet Minimum Requirement #5. Rain Gardens are in the second option on List #1 to address runoff from Roofs and from Other Hard Surfaces. If Full Dispersion (BMP T5.30) or Downspout Full Infiltration (BMP T5.10A) options are feasible, then those BMPs must be used instead of rain gardens.

### **2024 SWMMWW Reference:**

- Section I-3.4.5 MR5: On-Site Stormwater Management, pages 2-28 to 2-32

**4. Are there locations where a Rain garden is “infeasible” for Minimum Requirement #5?**

Ecology has a list of criteria for when a rain garden does not need to be considered to meet Minimum Requirement #5. These are called “infeasibility criteria.” These “infeasibility criteria” are separate from the “Where to Locate a Rain Garden” and “Where Not to Locate a Rain Garden” guidance discussed in the PLAN section of the Rain Garden Handbook. The infeasibility criteria for rain gardens used to meet Minimum Requirement #5 are the same as the infeasibility criteria for Bioretention. If the rain garden is deemed infeasible according to this criteria, then the project does not need to use a rain garden and can use the next BMP on List #1.

**2024 SWMMWW Reference:**

- Section V-5 Infiltration BMPs, BMP T7.30: Bioretention
  - Infeasibility Criteria, pages 780 to 783
- Section V-11 Miscellaneous LID BMPs BMP T5.14 Rain Gardens

**5. What types of site analyses are required for rain gardens used to help meet Minimum Requirement #5?**

Rain gardens used to meet Minimum Requirement #5 must meet Site Procedures and Design Guidance that are more extensive than those described in this Rain Garden Handbook. The 2024 SWMMWW outlines Ecology’s recommended testing criteria, but your City or County may have more specific requirements and other testing procedures.

**2024 SWMMWW References:**

- Section I-3.4.1 Preparation of Stormwater Site Plans:
- Section V-11 Miscellaneous LID BMPs BMP T5.14 Rain Gardens
- Section V-5.4 Determining the Design Infiltration Rate of the Native Soils (Note: The text concerning correction factors does not apply to rain garden designs.)

**6. How is a rain garden sized to meet Minimum Requirement #5?**

Rain gardens must have a minimum horizontal projected surface area below the overflow (Top Surface of Ponding, shown on page 28 of this Handbook) which is at least 5 percent of the area draining to it. The designer may choose a larger size, but rain garden performance does not need to be predicted with computer models to meet Minimum Requirement #5.

**2024 SWMMWW Reference:**

- Section V-11 Miscellaneous LID BMPs BMP T5.14 Rain Gardens

**Links to Resources**

To Download the 2024 SWMMWW visit: [www.ecy.wa.gov/programs/wq/stormwater/manual.html](http://www.ecy.wa.gov/programs/wq/stormwater/manual.html)

For more information on the Municipal Stormwater Permits visit: [ecology.wa.gov/Regulations-Permits/Permits-certifications/Stormwater-general-permits/Municipal-stormwater-general-permits](http://ecology.wa.gov/Regulations-Permits/Permits-certifications/Stormwater-general-permits/Municipal-stormwater-general-permits)

To see if your city or county is covered under a Municipal Stormwater Permit visit: [ecology.wa.gov/Regulations-Permits/Permits-certifications/Stormwater-general-permits/Municipal-stormwater-general-permits#municoverage](http://ecology.wa.gov/Regulations-Permits/Permits-certifications/Stormwater-general-permits/Municipal-stormwater-general-permits#municoverage)

The Municipal Stormwater Permits contain specific requirements for cities and counties to inspect rain gardens. Recent Guidance was provided in the Western Washington Low Impact Development (LID) Operation and Maintenance (O&M) Document. To download this document visit: [ecology.wa.gov/getattachment/0b070df2-4aff-4e74-821a-152e3fcb4ff5/LIDO-MGuidanceDocument.pdf](http://ecology.wa.gov/getattachment/0b070df2-4aff-4e74-821a-152e3fcb4ff5/LIDO-MGuidanceDocument.pdf)





